Preface

This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

Objectives

This document describes the Cisco 7600 Ethernet Services Plus line cards that are supported on the Cisco 7600 series routers. This document also describes how to install the Cisco 7600 Series ES+ line cards and how to troubleshoot the installation.

Changes to This Document

Table 1 records technical changes to this document. The table shows the Cisco IOS software release number and document revision number for the change, the date of the change, and a brief summary of the change.

Table 1 Document Revision History

Release No.	Revision	Date	Change Summary
15.3(1)S	OL-16146-10	November 2012	Added support for the 76-ES+XT-8TG high queue card.
15.2(4)S	OL-16146-09	July 2012	Added support for the 76-ES+T-8TG low queue card.
15.2(2)S	OL-16146-08	March 2012	Added support for two new low queue line cards: • 76-ES+T+XC-20G • 76-ES+T+XC-40G

Table 1 Document Revision History

15.1(2)S	OL-16146-07	March 2011	Added support for low power XFPs, XFP-10GLR-OC192SR-L and XFP-10GLR-OC192IR-L, to these ES+ line cards: • 7600 ES+ 2TG3C • 7600 ES+ 2TG3CXL • 7600 ES+ 4TG3C • 7600 ES+ 4TG3CXL • 76-ES+XT-2TG3C • 76-ES+XT-2TG3CXL • 76-ES+XT-4TG3C • 76-ES+XT-4TG3CXL • 76-ES+T-2TG • 76-ES+T-4TG • 76-ES+XC-20G3C • 76-ES+XC-20G3CXL • 76-ES+XC-40G3C • 76-ES+XC-40G3CXL
12.2(33)SRD5	OL-16146-06	October 2010	Added troubleshooting information for line card power issues in "Troubleshooting" chapter.
15.0(1)S	OL-16146-05	July 2010	Updated Table 1-3 for Cisco 7600 ES+ Line Card and Cisco IOS Release and Hardware Version Compatibility information in"Cisco 7600 Ethernet Services Plus Line Card Product Overview" chapter.
12.2(33)SRE	OL-16146-04	February 2010	Updated table 1-2 in chapter 1.

Table 1 Document Revision History

12.2(33)SRE	OL-16146-04	December 2009	Added support for the following line cards: • 7600-ES+20C3C • 7600-ES+20C3CXL • 7600-ES+40C3C • 7600-ES+40C3CXL • 76-ES+XT-2TG3C • 76-ES+XT-4TG3C Added support for additional DWDM SFPs (DWDM-SFP-3346, DWDM-SFP-3739, DWDM-SFP-4134, DWDM-SFP-4532, DWDM-SFP-4931, DWDM-SFP-5332, DWDM-SFP-5736, DWDM-SFP-6141)
12.2(33)SRD3	OL-16146-03	September 2009	Added support for the following line cards: 76-ES+T-20G 76-ES+T-2TG 76-ES+T-40G 76-ES+T-4TG
12.2(33)SRD1	OL-16146-02		Added support for the following ES+ Extended Transport (ES+XT) line cards: • 76-ES+XT-2TG3CXL • 76-ES+XT-4TG3CXL
12.2(33)SRD	OL-16146-01	February, 2007	Initial version.

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Cisco 7600 Ethernet Services Plus Line Card Product Overview	Provides an introduction to the Cisco 7600 Series Ethernet Services Plus line cards.
Chapter 2	Overview: Cisco 7600 Series Ethernet Services Plus Line Cards	Provides a compatibility summary for the Cisco 7600 Series Ethernet Services Plus line cards. For each supported ES+ line card, provides a summary of characteristics and an overview.
Chapter 3	Preparing to Install a Cisco 7600 Series Ethernet Services Plus Line Card	Describes the required tools, equipment, and safety guidelines for installing Cisco 7600 Series Ethernet Services Plus line cards.

Section	Title	Description
Chapter 4	Installing and Removing a Cisco 7600 Series Ethernet Services Plus Line Card	Describes the procedures for installing and removing Cisco 7600 Series Ethernet Services Plus line cards on a Cisco 7600 series router.
Chapter 5	Installing and Removing SFP and XFP Modules	Describes the procedures for installing and removing SFP and XFP modules on Cisco 7600 Series Ethernet Services Plus line cards.
Chapter 6	Troubleshooting	Provides information for troubleshooting the installation of Cisco 7600 Series Ethernet Services Plus line cards. It also describes helpful debug commands and provides packing instructions.

Related Documentation

The documentation listed below is available online and on the Documentation DVD.

Your router, switch, or gateway and the Cisco IOS software running on it contain extensive features, which are documented in the following resources:

- Cisco 7600 ES+ Ethernet Line Cards Configuration Guide
- Cisco IOS software:
  - For Cisco IOS configuration information and support, refer to the configuration guide or command reference for a Cisco IOS mainline release. You can also refer to the specific Cisco IOS software document for a particular feature.
  - To see if a feature is supported by a Cisco IOS release, to locate the software document for that feature, or to check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. You must be a registered user on Cisco.com to access this tool. To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **GO**. Click the link for the Software Advisor tool.

Note You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at http://www.cisco.com. Translated documentation is available at the following URL: http://www.cisco.com/web/siteassets/locator/index.html.

- For international agency compliance, safety, and statutory information for WAN interfaces:
  - *Regulatory Compliance and Safety Information for the Cisco* 7600 Series *Routers*
  - Site Preparation and Safety Guide

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What’s New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS Version 2.0.

CHAPTER 1

Cisco 7600 Ethernet Services Plus Line Card Product Overview

This chapter provides an introduction to the Cisco 7600 Series Ethernet Services Plus (ES+) line cards and ES+ combo low queue line cards. It includes the following sections:

Introduction to the Cisco 7600 ES+ and ES+ Combo Low Queue Line Cards

The Cisco 7600 Series ES+ line cards are a multiple-fabric, fixed-port Ethernet line card for the Cisco 7600 series routers that are capable of 40 gbps full-duplex traffic forwarding using a fixed port interface design. The Cisco 7600 Series ES+ line card versions are:

- 40-port version: 7600-ES+40G3C
- 40-port version: 7600-ES+40G3CXL
- 20-port version: 7600-ES+20G3C
- 20-port version: 7600-ES+20G3CXL
- 4-port version: 7600-ES+4TG3C
- 4-port version: 7600-ES+4TGCXL
- 2-port version: 7600-ES+2TG3C
- 2-port version: 7600-ES+2TGCXL
- 2-port version: 76-ES+XT-2TG3C
- 2-port version: 76-ES+XT-2TG3CXL
- 4-port version: 76-ES+XT-4TG3C
- 4-port version: 76-ES+XT-4TG3CXL
- 20-port version: 76-ES+T-20G
- 2-port version: 76-ES+T-2TG

- 40-port version: 76-ES+T-40G
- 4-port version: 76-ES+T-4TG
- 11-port version: 76-ES+XC-20G3C
- 11-port version: 76-ES+XC-20G3CXL
- 22-port version: 76-ES+XC-40G3C
- 22-port version: 76-ES+XC-40G3CXL
- 11-port version: 76-ES+T+XC-20G
- 22-port version: 76-ES+T+XC-40G
- 8-port version: 76-ES+T-8TG
- 8-port version: 76-ES+XT-8TG

The difference between the versions are the link interface daughter cards that accept small form-factor pluggable (SFP, SFP+, or XFP[1]) optical transceivers. Additionally, each of the versions has a common baseboard card and a control processor daughter card, except for the 8 port version (76-ES+T-8TG) which has a different baseboard.

The SFP, SFP+, and XFP modules allow the line cards to be configured for different media types (copper or fiber) and different optical requirements (single mode fiber or multimode fiber) as available.

See Table 1-4 for information about which SFPs, SFP+, or XFPs are accepted on the different Cisco 7600 Series ES+ line cards.

Product Overview

The Cisco 7600 Series ES+ line cards have the following features:

The system features listed here specify some of the key performance metrics and capabilities of the line cards. The information below applies to all four line cards unless stated otherwise.

- Line rate feature processing performance with 64 byte packets for four ports of 10 GE or forty ports of GE (59.52Mpps). Note that the line card throughput is limited by the system switch fabric. The packet processor and internal sections of the line card are full line rate throughput capable for 40GbE.
- Large output buffers provide up to 200 mS of round-trip-time buffer (100 mS in each direction) per 10GE port or 10xGE ports to prevent transient output overloads from causing spurious packet loss.
- Up to 32K queues (per 10GE port or 10xGE ports) per direction for input or output queuing and scheduling.
- Programmable ingress and egress feature processing capability through the Trident.
- 40+ Mpps Layer 3 or Layer 4 forwarding, 125Mpps Layer 2 forwarding.
- Dual fabric attachment providing an aggregate bandwidth of 40Gb/s, full duplex (each fabric channel provides 20Gb/s, full duplex).
- 512-MB boot disk

1. SFP modules are optics modules with speeds lower than 10 Gbps; SFP+ and XFP modules are optics modules with speeds equal to or greater than 10 Gbps.

Cisco 7600 Series Ethernet Services Plus Line Card Product Numbers

Table 1-1 lists the Cisco product numbers for the line cards.

Table 1-1 Cisco 7600 Ethernet Services Plus Line Card Product Numbers

Description	Cisco Product Number	Field-Replaceable Unit (FRU) Product ID
20xGE SFP with DFC 3C	7600-ES+20G3C	7600-ES+20G3C=
20xGE SFP with DFC 3CXL	7600-ES+20G3CXL	7600-ES+20G3CXL=
2x10GE XFP with DFC 3C	7600-ES+2TG3C	7600-ES+2TG3C=
2x10GE XFP with DFC 3CXL	7600-ES+2TG3CXL	7600-ES+2TG3CXL=
40xGE SFP with DFC 3C	7600-ES+40G3C	7600-ES+40G3C=
40xGE SFP with DFC 3CXL	7600-ES+40G3CXL	7600-ES+40G3CXL=
4x10GE XFP with DFC 3C	7600-ES+4TG3C	7600-ES+4TG3C=
4x10GE XFP with DFC 3CXL	7600-ES+4TG3CXL	7600-ES+4TG3CXL=
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3C	76-ES+XT-2TG3C	76-ES+XT-2TG3C=
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3CXL	76-ES+XT-2TG3CXL	76-ES+XT-2TG3CXL=
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3C	76-ES+XT-4TG3C	76-ES+XT-4TG3C=
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3CXL	76-ES+XT-4TG3CXL	76-ES+XT-4TG3CXL=
20xGE with DFC 3CXL	76-ES+T-20G	76-ES+T-20G=
2x10GE with DFC 3CXL	76-ES+T-2TG	76-ES+T-2TG=
40xGE with DFC 3CXL	76-ES+T-40G	76-ES+T-40G=
4x10GE with DFC 3CXL	76-ES+T-4TG	76-ES+T-4TG=
7600 ES+XC, LAN/WAN PHY, OTN/G.709, Combo 10x1GE/ 1x10GE, DFC3C	76-ES+XC-20G3C	76-ES+XC-20G3C=
7600 ES+XC, LAN/WAN PHY, OTN/G.709, Combo 10x1GE/ 1x10GE, DFC3CXL	76-ES+XC-20G3CXL	76-ES+XC-20G3CXL=
7600 ES+XC, LAN/WAN PHY, OTN/G.709, Combo 20x1GE/ 2x10GE, DFC3C	76-ES+XC-40G3C	76-ES+XC-40G3C=
7600 ES+XC, LAN/WAN PHY, OTN/G.709, Combo 20x1GE/ 2x10GE, DFC3CXL	76-ES+XC-40G3CXL	76-ES+XC-40G3CXL=
7600 ES+XC, LAN/WAN PHY, OTN/G.709, Combo 10x1GE/ 1x10GE, DFC3CXL	76-ES+T+XC-20G	76-ES+T+XC-20G=
7600 ES+XC, LAN/WAN PHY, OTN/G.709, Combo 20x1GE/ 2x10GE, DFC3CXL	76-ES+T+XC-40G	76-ES+T+XC-40G=
8x10GE with DFC 3CXL	76-ES+T-8TG	76-ES+T-8TG=
8x10GE with DFC 3CXL	76-ES+XT-8TG3CXL	76-ES+XT-8TG3CXL=

Note The Distributed Forwarding Card (DFC) on a 7600 ES+ line card functions at the level of the lowest common denominator DFC in the system. If the only DFC in a system is a DFC 3CXL, then the system would operate at the 3CXL level. If a DFC 3CXL is configured in a system with a DFC3BXL present, then the system will function at the DFC 3BXL level. Additionally, a DFC 3CXL provides for more TCAM entries than does a DFC 3C.

Supported Platforms

Table 1-2 lists the supported router platforms for Cisco 7600 ES+ line cards:

Table 1-2 Cisco 7600 ES+ Line Card Supported Router Platforms

Cisco 7600 ES+ Line Card	Supported Platform
7600-ES+20G3C	All Cisco 7600 series routers except for the Cisco 7603 router
7600-ES+20G3CXL	All Cisco 7600 series routers except for the Cisco 7603 router
7600-ES+2TG3C	All Cisco 7600 series routers except for the Cisco 7603 router
7600-ES+2TG3CXL	All Cisco 7600 series routers except for the Cisco 7603 router
7600-ES+40G3C	All Cisco 7600 series routers except for the Cisco 7603 router
7600-ES+40G3CXL	Except for the Cisco 7603 router, all Cisco 7600 series routers including 7603-S.
7600-ES+4TG3C	All Cisco 7600 series routers except for the Cisco 7603 router
7600-ES+4TG3CXL	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XT-2TG3C	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XT-2TG3CXL	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XT-4TG3C	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XT-4TG3CXL	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+T-20G	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+T-2TG	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+T-40G	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+T-4TG	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XC-20G3C	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XC-20G3CXL	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XC-40G3C	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XC-40G3CXL	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+T+XC-20G	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+T+XC-40G	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+T-8TG	All Cisco 7600 series routers except for the Cisco 7603 router
76-ES+XT-8TG3CXL	All Cisco 7600 series routers except for the Cisco 7603 router

Cisco IOS Software Release and Hardware Revision Requirements

The Cisco 7600 ES+ line cards have certain Cisco IOS software requirements. Also, to ensure compatibility with the software, your Cisco 7600 ES+ line card should have a specific hardware revision number. The number is printed on a label affixed to the component side of the card and is displayed by the **show diag** command.

Table 1-3 lists the hardware and software requirements for Cisco 7600 ES+ line cards.

Table 1-3 Cisco 7600 ES+ Line Card and Cisco IOS Release and Hardware Version Compatibility

Cisco 7600 ES+ Line Card	Cisco Product Number	Required Hardware Version	Minimum Cisco IOS Software Release
7600 ES+ Line Card, 20xGE SFP with DFC 3C	7600-ES+20G3C	68-2868-05	Cisco IOS Release 12.2(33)SRD
7600 ES+ Line Card, 20xGE SFP with DFC 3CXL	7600-ES+20G3CXL	68-3030-05	Cisco IOS Release 12.2(33)SRD
7600 ES+ Line Card, 2x10GE XFP with DFC 3C	7600-ES+2TG3C	68-2867-04	Cisco IOS Release 12.2(33)SRD
7600 ES+ Line Card, 2x10GE XFP with DFC 3CXL	7600-ES+2TG3CXL	68-3029-04	Cisco IOS Release 12.2(33)SRD
7600 ES+ Line Card, 40xGE SFP with DFC 3C	7600-ES+40G3C	68-2869-05	Cisco IOS Release 12.2(33)SRD
7600 ES+ Line Card, 40xGE SFP with DFC 3CXL	7600-ES+40G3CXL	68-3032-05	Cisco IOS Release 12.2(33)SRD
7600 ES+ Line Card, 4x10GE XFP with DFC 3C	7600-ES+4TG3C	68-2866-06	Cisco IOS Release 12.2(33)SRD
7600 ES+ Line Card, 4x10GE XFP with DFC 3CXL	7600-ES+4TG3CXL	68-3031-06	Cisco IOS Release 12.2(33)SRD
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3C	76-ES+XT-2TG3C	68-3558-01	Cisco IOS Release 12.2(33)SRD1
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3CXL	76-ES+XT-2TG3CXL	68-3335-03	Cisco IOS Release 12.2(33)SRD1
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3C	76-ES+XT-4TG3C	68-3557-01	Cisco IOS Release 12.2(33)SRD1
7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3CXL	76-ES+XT-4TG3CXL	68-3336-03	Cisco IOS Release 12.2(33)SRD1
7600 ES+T Line Card, 20xGE SFP with DFC 3CXL	76-ES+T-20G	68-3030-06	Cisco IOS Release 12.2(33)SRD4
7600 ES+XT, LAN/WAN PHY, OTN/G.709, Low Queue, 2x10GE, XFP, DFC3CXL	76-ES+T-2TG	68-3029-05	Cisco IOS Release 12.2(33)SRD4
7600 ES+T Line Card, 40xGE SFP with DFC 3CXL	76-ES+T-40G	68-3032-06	Cisco IOS Release 12.2(33)SRD4

Table 1-3 (continued)Cisco 7600 ES+ Line Card and Cisco IOS Release and Hardware Version Compatibility (continued)

Cisco 7600 ES+ Line Card	Cisco Product Number	Required Hardware Version	Minimum Cisco IOS Software Release
7600 ES+XT, LAN/WAN PHY, OTN/G.709, Low Queue, 4x10GE, XFP, DFC3CXL	76-ES+T-4TG	68-3031-05	Cisco IOS Release 12.2(33)SRD4
7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3C	76-ES+XC-20G3C	68-3168-06	Cisco IOS Release 12.2(33)SRE
7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3CXL	76-ES+XC-20G3CXL	68-3169-06	Cisco IOS Release 12.2(33)SRE
7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3C	76-ES+XC-40G3C	68-3166-06	Cisco IOS Release 12.2(33)SRE
7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3CXL	76-ES+XC-40G3CXL	68-3167-06	Cisco IOS Release 12.2(33)SRE
7600 ES+XC Combo low queue 10x1GE/ 1x10GE, DFC3CXL	76-ES+T+XC-20G	68-4492-2	Cisco IOS 15.2(2)S
7600 ES+XC Combo low queue 20x1GE/ 2x10GE, DFC3CXL	76-ES+T+XC-40G	68-4492-1	Cisco IOS 15.2(2)S
7600 ES+T Low queue 8x 10GE, DFC3CXL	76-ES+T-8TG		Cisco IOS 15.2(4)S
7600 ES+T High queue 8x 10GE, DFC3CXL	76-ES+XT-8TG3CXL	68-4765-01	Cisco IOS 15.3(1)S

The **show diag** *slot_number*, **show version**, and **show hardware** commands display the current hardware configuration of the router, including the system software version that is currently loaded and running, and the hardware revision number. For complete descriptions of **show** commands, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide* and the *Cisco IOS Configuration Fundamentals Command Reference* for the installed Cisco IOS release.

If the command displays indicate that the Cisco IOS software is a version earlier than you need, check the contents of flash memory to determine if the required images are available on your system. The **dir** *devicename* command displays a list of all files stored in flash memory. If you do not have the correct software version, contact Cisco customer service.

For software configuration information, refer to the Cisco IOS software configuration and command reference publications for the installed Cisco IOS release. Also refer to the Cisco IOS software release notes for additional information.

Modular Optics Compatibility

The Cisco 7600 Series ES+ line cards use small form-factor pluggable (SFP, SFP+, or XFP) optical transceivers to provide network connectivity. Table 1-4 provides links to tables showing the supported modules for the different Cisco 7600 Series ES+ line cards.

Table 1-4 Supported Optical Transceiver Modules

Line Cards	Supported Modules
7600-ES+20G3C	Cisco 7600 ES+ 20G3C, -20G3CXL Supported SFP Modules; see Table 2-16 on page 2-16.
7600-ES+20G3CXL	
7600-ES+2TG3C	Cisco 7600 ES+ 2TG3C, -3CXL Supported XFP Modules; see Table 2-5 on page 2-7.
7600-ES+2TG3CXL	
7600-ES+40G3C	Cisco 7600 ES+ 40G3C, -40G3CXL Supported SFP Modules; see Table 2-21 on page 2-21.
7600-ES+40G3CXL	
7600-ES+4TG3C	Cisco 7600 ES+ 4TG3C, -4TG3CXL Supported XFP Modules; see Table 2-10 on page 2-11.
7600-ES+4TG3CXL	
76-ES+XT-2TG3C	Cisco 76-ES+XT-2TG3C, -2TG3CXL Supported XFP Modules; see Table 2-26 on page 2-26.
76-ES+XT-2TG3CXL	
76-ES+XT-4TG3C	Cisco 76-ES+XT-2TG3C, -2TG3CXL Supported XFP Modules; see Table 2-31 on page 2-31.
76-ES+XT-4TG3CXL	
76-ES+T-20G	Supported SFP Modules; see Table 2-16 on page 2-16
76-ES+T-2TG	Supported XFP Modules; see Table 2-26 on page 2-26
76-ES+T-40G	Supported SFP Modules; see Table 2-21 on page 2-21
76-ES+T-4TG	Supported XFP Modules; see Table 2-31 on page 2-31
76-ES+XC-20G3C	Supported SFP Modules; see TBD; Supported XFP Modules; see TBD
76-ES+XC-20G3CXL	Supported SFP Modules; see TBD; Supported XFP Modules; see TBD
76-ES+XC-40G3C	Supported SFP Modules; see TBD; Supported XFP Modules; see TBD
76-ES+XC-40G3CXL	Supported SFP Modules; see TBD; Supported XFP Modules; see TBD
76-ES+T-8TG	Supported SFP+ Modules; see Table 2-78.
76-ES+XT-8TG	Supported SFP+ Modules; see Table 2-83

Power Management

The Cisco ES+ line cards consume chassis power; you must make sure the chassis is within the power budget on Cisco 7600 series routers. See Table 1-5.

Table 1-5 Cisco 7600 ES+ Line Card Power Consumption

Cisco 7600 Series ES+ line cards	Power Consumption (Maximum in Watts)
7600-ES+20G3C	277
7600-ES+20G3CXL	305
7600-ES+2TG3C	269
7600-ES+2TG3CXL	297
7600-ES+40G3C	391
7600-ES+40G3CXL	419
7600-ES+4TG3C	371
7600-ES+4TG3CXL	399
76-ES+XT-2TG3C	273
76-ES+XT-2TG3CXL	301
76-ES+XT-4TG3C	378
76-ES+XT-4TG3CXL	406
76-ES+T-20G	305
76-ES+T-2TG	301
76-ES+T-40G	419
76-ES+T-4TG	406
7600-ES+XC-20G3C	309
7600-ES+XC-20G3CXL	337
7600-ES+XC-40G3C	399
7600-ES+XC-40G3CXL	427
76-ES+T+XC-20G	337
76-ES+T+XC-40G	427
76-ES+T-8TG	433
76-ES+XT-8TG	433

If the power limit is exceeded, the Cisco ES+ line card is not powered up and an error message is displayed.

```
Router#%C7KPWR-SP-4-POWERDENIED:insufficient power, module in slot 3 power denied.
```

On a Cisco 7600 series router, use the **show power** command on the Route Processor to determine how much power you have available in the chassis and how much is being used or reserved by line cards, supervisor engines, and fan trays.

Note The **show power** command displays only the values programmed in the IDPROM and the IDPROM is not dynamically updated for different power values.

This is sample output for the **show power** command on a Cisco 7600 series router:

```
Router# show power

system power redundancy mode = redundant
system power redundancy operationally = non-redundant
system power total =     3795.12 Watts (90.36 Amps @ 42V)
system power used =      3320.94 Watts (79.07 Amps @ 42V)
system power available =  474.18 Watts (11.29 Amps @ 42V)
                         Power-Capacity PS-Fan Output Oper
PS   Type                Watts   A @42V Status Status State
---- ------------------ ------- ------ ------ ------ -----
1    WS-CAC-4000W-INT   3795.12 90.36  OK     OK     on
2    none
                         Pwr-Allocated  Oper
Fan  Type                Watts   A @42V State
---- ------------------ ------- ------ -----
1    WS-C6K-13SLT-FAN2   298.20  7.10  OK
                         Pwr-Requested  Pwr-Allocated  Admin Oper
Slot Card-Type           Watts   A @42V Watts   A @42V State State
---- ------------------ ------- ------ ------- ------ ----- -----
2    7600-SIP-200        240.24  5.72   240.24  5.72  on    on
3    WS-X6724-SFP        125.16  2.98   125.16  2.98  on    on
4    7600-SIP-400        265.02  6.31   265.02  6.31  on    on
7    RSP720-3CXL-GE      354.06  8.43   354.06  8.43  on    on
8    RSP720-3C-GE        354.06  8.43   354.06  8.43  on    on
9    7600-ESM-BASE       304.92  7.26   304.92  7.26  on    on
10   7600-ES+20G3CXL     297.36  7.08   297.36  7.08  on    on
11   7600-SIP-600        341.88  8.14   341.88  8.14  on    on
12   7600-SIP-600        341.88  8.14   341.88  8.14  on    on
13   WS-X6704-10GE       398.16  9.48   398.16  9.48  on    on
Router#
```

This is sample output for the **show power** command on a Cisco 7600 series router for a 76-ES+T+XC-40G low queue combo card:

```
A3-2#show power
system power redundancy mode = redundant
system power redundancy operationally = non-redundant
system power total = 2671.20 Watts (63.60 Amps @ 42V)
system power used = 1477.14 Watts (35.17 Amps @ 42V)
system power available = 1194.06 Watts (28.43 Amps @ 42V)
Power-Capacity PS-Fan Output Oper
PS Type Watts A @42V Status Status State
---- ------------------ ------- ------ ------ ------ -----
1 WS-CAC-6000W 2671.20 63.60 OK OK on
2 none
Pwr-Requested Pwr-Allocated Admin Oper
Slot Card-Type Watts A @42V Watts A @42V State State
---- ------------------ ------- ------ ------- ------ ----- -----
1 7600-SIP-600 341.88 8.14 341.88 8.14 on on
4 7600-ES20-GE3C 340.20 8.10 - - off off (admin request)
5 (Redundant Sup) - - 354.06 8.43 - -
6 RSP720-3CXL-GE 354.06 8.43 354.06 8.43 on on
7 7600-ES+20G3C 276.36 6.58 - - off off (admin request)
8 7600-ES20-GE3C 340.20 8.10 - - off off (admin request)
9 '76-ES+T+XC-40G' 427.14 10.17 427.14 10.17 on on
```

This is sample output for the **show power** command on a Cisco 7600 series router for a 76-ES+T+XC-20G low queue combo card:

```
A1-2#show power
system power redundancy mode = redundant
system power redundancy operationally = non-redundant
system power total = 2669.10 Watts (63.55 Amps @ 42V)
system power used = 2181.90 Watts (51.95 Amps @ 42V)
system power available = 487.20 Watts (11.60 Amps @ 42V)
Power-Capacity PS-Fan Output Oper
PS Type Watts A @42V Status Status State
---- ------------------ ------- ------ ------ ------ -----
1 PWR-2700-AC 2669.10 63.55 OK OK on
2 none
Pwr-Allocated Oper
Fan Type Watts A @42V State
---- ------------------ ------- ------ -----
1 FAN-MOD-6HS 180.18 4.29 OK
Pwr-Requested Pwr-Allocated Admin Oper
Slot Card-Type Watts A @42V Watts A @42V State State
---- ------------------ ------- ------ ------- ------ ----- -----
1 76-ES+T+XC-20G 337.26 8.03 337.26 8.03 on on
2 WS-X6748-GE-TX 325.50 7.75 325.50 7.75 on on
3 7600-ES20-10G3CXL 340.20 8.10 340.20 8.10 on on
4 7600-SIP-600 341.88 8.14 341.88 8.14 on on
5 (Redundant Sup) - - 328.44 7.82 - -
6 WS-SUP720-3BXL 328.44 7.82 328.44 7.82 on on
```

This is sample output for the **show power** command on a Cisco 7600 series router for a 76-ES+T-8TG low queue card:

```
Router#show power
system power redundancy mode = redundant
system power redundancy operationally = non-redundant
system power total =     2671.20 Watts (63.60 Amps @ 42V)
system power used =      1536.36 Watts (36.58 Amps @ 42V)
system power available = 1134.84 Watts (27.02 Amps @ 42V)
                       Power-Capacity PS-Fan Output Oper
PS   Type              Watts   A @42V Status Status State
---- ----------------- ------- ------ ------ ------ -----
1    WS-CAC-6000W      2671.20 63.60  OK     OK     on
2    none
                       Pwr-Allocated  Oper
Fan  Type              Watts   A @42V State
---- ----------------- ------- ------ -----
1    FAN-MOD-9SHS       241.50  5.75  OK
2    FAN-MOD-9SHS       241.50  5.75  OK
                       Pwr-Requested  Pwr-Allocated  Admin Oper
Slot Card-Type         Watts   A @42V Watts   A @42V State State
---- ----------------- ------- ------ ------- ------ ----- -----
2    76-ES+T-8TG        432.60 10.30   432.60 10.30  on    on
5    (Redundant Sup)      -     -      310.38  7.39  -     -
6    RSP720-3C-GE       310.38  7.39   310.38  7.39  on    on
```

CHAPTER 2

Overview: Cisco 7600 Series Ethernet Services Plus Line Cards

This chapter describes the Cisco 7600 Series Ethernet Services + line cards that are supported on the Cisco 7600 series routers and contains the following sections:

Cisco 7600 Series Ethernet Services Plus Line Card Summary

Summary descriptions of the Cisco 7600 Cisco 7600 Series ES+ line cards that are supported on the Cisco 7600 series routers are shown in Table 2-1.

Table 2-1 Cisco 7600 ES+ Line Card Summary

Product Numbers	Description	Maximum Number of SFPs or XFPs	Minimum Cisco IOS Release
7600-ES+20G3C, 7600-ES+20G3CXL	7600 ES+ Line Card, 20xGE SFP with DFC 3C 7600 ES+ Line Card, 20xGE SFP with DFC 3CXL	20 SFPs	Cisco IOS Release 12.2(33)SRD
7600-ES+2TG3C, 7600-ES+2TG3CXL	7600 ES+ Line Card, 2x10GE XFP with DFC 3C 7600 ES+ Line Card, 2x10GE XFP with DFC 3CXL	2 XFPs	Cisco IOS Release 12.2(33)SRD
7600-ES+40G3C, 7600-ES+40G3CXL	7600 ES+ Line Card, 40xGE SFP with DFC 3C 7600 ES+ Line Card, 40xGE SFP with DFC 3CXL	40 SFPs	Cisco IOS Release 12.2(33)SRD
7600-ES+4TG3C, 7600-ES+4TG3CXL	7600 ES+ Line Card, 4x10GE XFP with DFC 3C 7600 ES+ Line Card, 4x10GE XFP with DFC 3CXL	4 XFPs	Cisco IOS Release 12.2(33)SRD
76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL	7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3C 7600 ES+XT, LAN/WAN PHY, OTN/G.709, 2x10GE, XFP, DFC3CXL	2 XFPs	Cisco IOS Release 12.2(33)SRD1
76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL	7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3C 7600 ES+XT, LAN/WAN PHY, OTN/G.709, 4x10GE, XFP, DFC3CXL	4 XFPs	Cisco IOS Release 12.2(33)SRD1
76-ES+T-20G	7600 ES+T Line Card, 20xGE SFP with DFC 3CXL	20 SFPs	Cisco IOS Release 12.2(33)SRD3
76-ES+T-40G	7600 ES+T Line Card, 40xGE SFP with DFC 3CX	40 SFPs	Cisco IOS Release 12.2(33)SRD3
76-ES+T-2TG	7600 ES+XT, LAN/WAN PHY, OTN/G.709,Low queue, 2x10GE, XFP, DFC3CXL	2 XFPs	Cisco IOS Release 12.2(33)SRD3

Table 2-1 Cisco 7600 ES+ Line Card Summary (continued)

Product Numbers	Description	Maximum Number of SFPs or XFPs	Minimum Cisco IOS Release
76-ES+T-4TG3XCL	7600 ES+XT, LAN/WAN PHY, OTN/G.709,Low queue, 4x10GE, XFP, DFC3CXL	4 XFPs	Cisco IOS Release 12.2(33)SRD3
76-ES+XC-20G3C 76-ES+XC-20G3CXL	7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3C 7600 ES+XC Combo 10x1GE/ 1x10GE, DFC3CXL	10 SFPs, 1 XFP	Cisco IOS Release 12.2(33)SRE
76-ES+XC-40G3C 76-ES+XC-40G3CXL	7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3C 7600 ES+XC Combo 20x1GE/ 2x10GE, DFC3CXL	20 SFPs, 2 XFPs	Cisco IOS Release 12.2(33)SRE

Checking Hardware and Software Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether the Cisco 7600 Series ES+ line cards within a system are compatible, but it does provide the minimum Cisco IOS requirements for individual hardware modules or components.

Note Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **GO**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

Identifying Slots and Subslots for the Cisco 7600 Cisco 7600 Series ES+ Line Cards

This section describes how to specify the physical location of a Cisco 7600 Cisco 7600 Series ES+ line cards on the Cisco 7600 series routers within the command-line interface (CLI) to configure or monitor those devices.

Specifying the Slot Location for a Cisco 7600 Cisco 7600 Series ES+ Line Cards

The Cisco 7600 series routers support different chassis models, each of which supports a certain number of chassis slots.

Note The Cisco 7600 Series ES+ line cards are not supported with a Supervisor Engine 1, Supervisor Engine 1A, Supervisor Engine 2, Supervisor Engine 720-3A, or Supervisor Engine 32.

For information about the chassis slots available in different Cisco 7600 series router models, see http://www.cisco.com/univercd/cc/td/doc/product/core/cis7600/hardware/cis_76xx/osr_over.htm.

Some commands allow you to display information about the Cisco 7600 Series ES+ line card itself, such as **show module**, **show idprom module**, **show hw-module slot**, and **show diagbus**. These commands require you to specify the chassis slot location where the Cisco 7600 Series ES+ line card that you want information about is installed.

For example, to display status and information about the Cisco 7600 Series ES+ line card installed in slot 10 of a Cisco 7609 router, enter the following command:

```
Router# show module 10

Mod Ports Card Type                                Model              Serial No.
--- ----- ---------------------------------------- ------------------ -----------
 10   20  7600 ES+                                 7600-ES+20G3CXL    JAE1151865I

Mod MAC addresses                       Hw    Fw           Sw           Status
--- ----------------------------------- ------ ------------ ------------ -------
 10  001d.e5e8.2a00 to 001d.e5e8.2a3f   0.301 12.2(33r)SRD 12.2(nightly Ok

Mod  Sub-Module                  Model               Serial       Hw     Status
---- --------------------------- ------------------ ----------- ------- -------
 10  7600 ES+ DFC XL             7600-ES+3CXL       JAE115188YM  0.200  Ok
 10  7600 ES+ 20xGE SFP          7600-ES+20G        JAE1151860R  0.301  Ok

Mod  Online Diag Status
---- -------------------
 10  Pass
Router#
```

For more information about Cisco 7600 Series ES+ line card commands, see the *Cisco IOS Software Releases 12.2 SR Command References*.

Note The Cisco 7600 Series ES+ line card must be in a slot that provides two primary serial channels. Dual serial channels are not available in all slots of a 13-slot chassis. Dual fabric connectivity is supported in slots 9 to 13.

Cisco 7600 ES+ Line Card Slot, Bay, and Port Locations

The Cisco 7600 Series ES+ line card uses a <slot, port> numbering scheme. The slot refers to whichever slot the line card occupies in the router. The port numbering begins at 1 on all versions of the Cisco 7600 Series ES+ line card. The upper limit depends on the card type. This physical port numbering is reflected in CLI messages and all references to port numbers that are visible to the user.

Executing the **show interface** command for a Cisco 7600 Series ES+ line card located in slot 10 of a Cisco 7600 series router chassis produces the following (only first six interfaces are shown):

```
Router# show interfaces gigabitEthernet 10/2

GigabitEthernet10/2 is up, line protocol is up (connected)
  Hardware is X40G 1Gb 802.3, address is 000f.35c2.ec00 (bia 000f.35c2.ec00)
  Description: connect to test 7/2
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
```

```
   reliability 255/255, txload 196/255, rxload 196/255
Encapsulation ARPA, loopback not set
Keepalive set (10 sec)
Full-duplex, 1000Mb/s
input flow-control is off, output flow-control is off
Clock mode is auto
ARP type: ARPA, ARP Timeout 04:00:00
Last input never, output 00:00:24, output hang never
Last clearing of "show interface" counters 00:00:12
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 772455000 bits/sec, 1419960 packets/sec
5 minute output rate 772455000 bits/sec, 1419960 packets/sec
L2 Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes
L3 in Switched: ucast: 0 pkt, 0 bytes - mcast: 0 pkt, 0 bytes mcast
L3 out Switched: ucast: 0 pkt, 0 bytes mcast: 0 pkt, 0 bytes
   11363519 packets input, 772719292 bytes, 0 no buffer
   Received 0 broadcasts (0 IP multicasts)
   0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
   0 watchdog, 0 multicast, 0 pause input
   0 input packets with dribble condition detected
   11363519 packets output, 772719292 bytes, 0 underruns
   0 output errors, 0 collisions, 0 interface resets
   0 babbles, 0 late collision, 0 deferred
   0 lost carrier, 0 no carrier, 0 pause output
   0 output buffer failures, 0 output buffers swapped out
```

For more information about Cisco 7600 Series ES+ line card commands, see the *Cisco IOS Software Releases 12.2 SR Command References*.

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Overview

The following sections describe the Cisco 7600 Series ES+ line card:

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards are listed in Table 2-2.

Table 2-2 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Processors

Type	Speed	Description
Processor	300 megahertz (MHz) internal operating frequency	Trident
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card LEDs

The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-1 and Figure 2-2. Table 2-3 provides LED descriptions.

Figure 2-1 Cisco 7600 ES+ 2TG3C

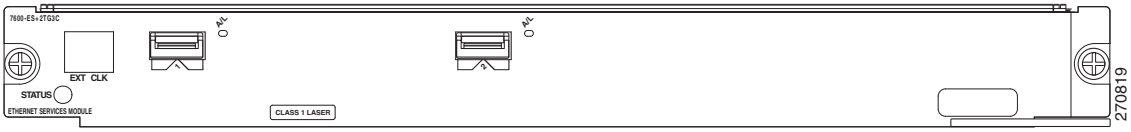
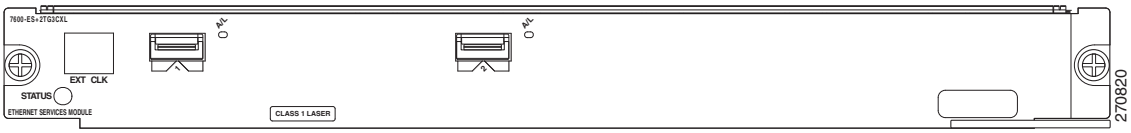


Figure 2-2 Cisco 7600 ES+ 2TG3CXL Faceplate



There is one line card Status LED and two port Status LEDs. Table 2-3 provides LED descriptions.

Table 2-3 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Physical Specifications

The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL physical specifications are shown in Table 2-4.

Table 2-4 7600-ES+ 2TG3C,7600-ES+ 2TG33CXL Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)

Table 2-4 7600-ES+ 2TG3C,7600-ES+ 2TG33CXL Physical Specifications (continued)

Description	Specifications
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Memory Options

Table 2-5 lists the memory options available for the 7600-ES+ 2TG3C, -3CXL line cards:

Table 2-5 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 2TG3C	1 GB
Cisco 7600 ES+ 2T3CXL	2 GB

Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Supported XFP Modules

The Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line cards support the XFP modules listed in Table 2-6.

Table 2-6 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10.GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF.
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF.
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF.
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF.
XFP-10G-MM-SR	Cisco multirate XFP transceiver module for 10GBASE-SR Ethernet and OC-192/STM-64 short-reach (SR-1) Packet-over-SONET/SDH (POS) applications, SMF, dual LC connector, and Multimode fiber.
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid).
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid).
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid).
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid).
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid).
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid).
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid).

Table 2-6 Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid).
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid).
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid).
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid).
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid).
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid).
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid).
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid).
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid).
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid).
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid).
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid).
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid).
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid).
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid).
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid).
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid).
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid).
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid).
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid).
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid).
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid).
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid).
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid).

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

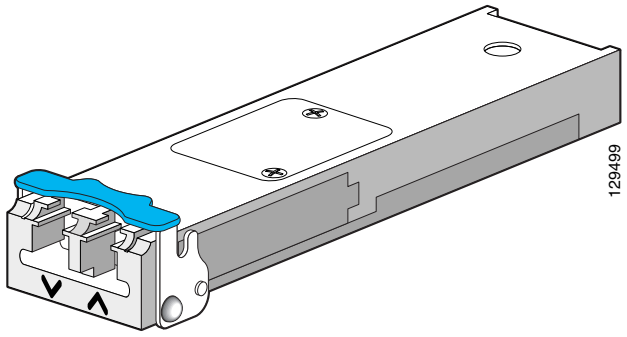
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-3 shows a typical XFP module.

Figure 2-3 XFP Module



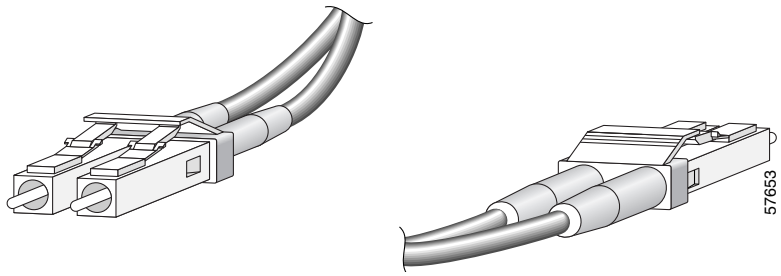
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-4 shows the cable type for use with the XFP optical transceiver module on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line card.

Figure 2-4 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Overview

The following sections describe the Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards:

- Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules, page 2-11

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards are listed in Table 2-7.

Table 2-7 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card LEDs

The Cisco 7600 ES+ 4TG3C, 7600 ES+4TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-5 and Figure 2-6. Table 2-8 provides LED descriptions.

Figure 2-5 Cisco 7600 ES+ 4TG3C Faceplate

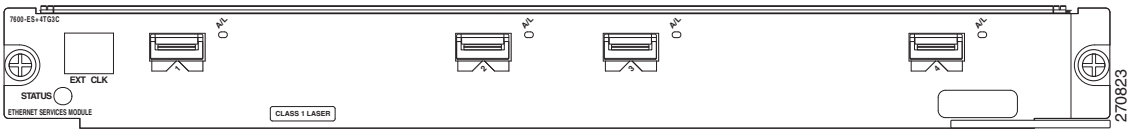
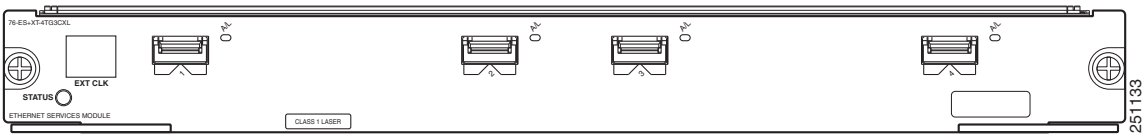


Figure 2-6 Cisco 7600 ES+ 4TG3CXL Faceplate



There is one line card Status LED and two port Status LEDs. Table 2-3 provides LED descriptions.

Table 2-8 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.

Table 2-8 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL LEDs (continued)

LED Label	Color	State	Meaning
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Physical Specifications

The Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL physical specifications are shown in Table 2-9.

Table 2-9 7600-ES+ 4TG3C, 7600-ES+ 4TG3CXL Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Memory Options

Table 2-10 lists the memory options available for the Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL line cards:

Table 2-10 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 4TG3C	1 GB
Cisco 7600 ES+ 4TG3CXL	2 GB

Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules

The Cisco 7600 ES+ 4TG3C, -3CXL line cards support the XFP modules listed in Table 2-11

Table 2-11 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF

Table 2-11 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules (continued)

XFP	Description
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)

Table 2-11 Cisco 7600 ES+ 4TG3C, 7600 ES+ 4TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

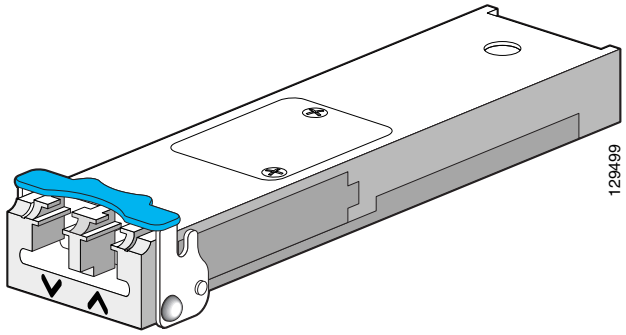
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-7 shows a typical XFP module.

Figure 2-7 XFP Module



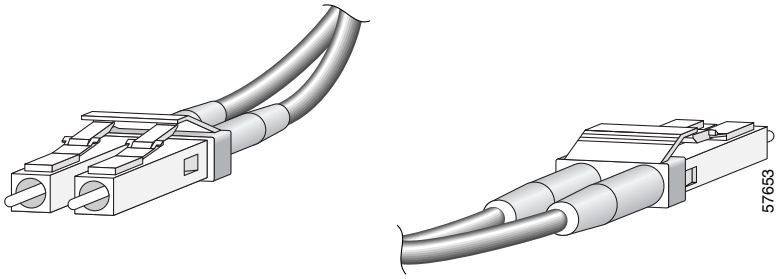
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ 4TG3C, -3CXL line cards require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-8 shows the cable type for use with the XFP optical transceiver module on the Cisco 7600 ES+ 4TG3C, -3CXL line card.

Figure 2-8 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Overview

The following sections describe the Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards:

- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Processors, page 2-14
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card LEDs, page 2-14
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Physical Specifications, page 2-15
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Memory Options, page 2-16
- Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules, page 2-16

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards are listed in Table 2-12.

Table 2-12 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card LEDs

The Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-9 and Figure 2-10.

Figure 2-9 Cisco 7600 ES+ 20G3C Line Card Faceplate

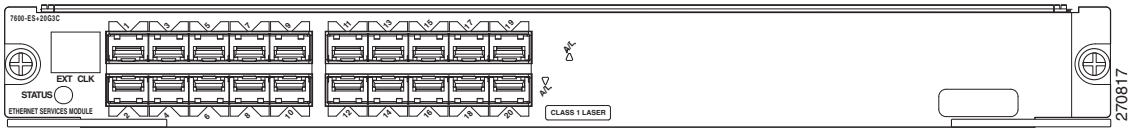


Figure 2-10 Cisco 7600 ES+ 20G3CXL Line Card Faceplate

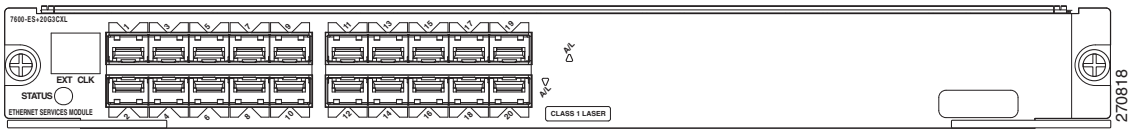


Table 2-13 provides LED descriptions.

Table 2-13 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Physical Specifications

The Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line card physical specifications are shown in Table 2-14.

Table 2-14 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 20G3C, -20G3CX line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Memory Options

Table 2-15 lists the memory options available for the Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards:

Table 2-15 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 20G3C	1 GB
Cisco 7600 ES+ 20G3XL	2 GB

Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules

The Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-16

Table 2-16 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)

Table 2-16 Cisco 7600 ES+ 20G3C, 7600 ES+ 20G3CXL Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

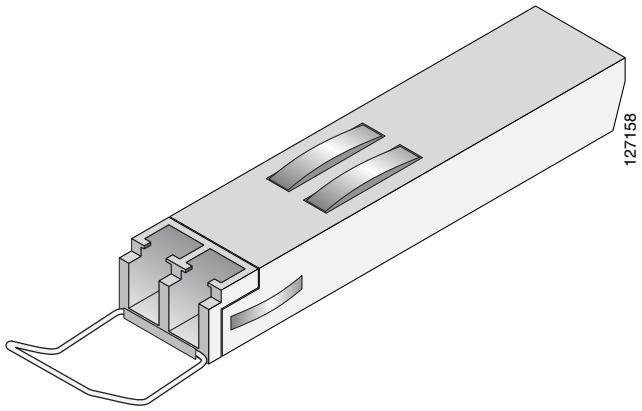
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-11 shows a typical SFP module.

Figure 2-11 SFP Optics Module



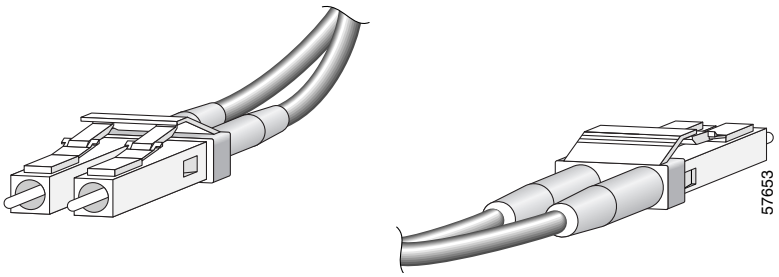
Connectors and Cabling

The SFP optical transceiver module on the Cisco 7600 ES+ 20G3C, -3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-12.

Figure 2-12 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Overview

The following sections describe the Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards:

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Processors

The processors on the Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line card are listed in Table 2-17.

Table 2-17 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card LEDs

The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-13 and Figure 2-14.

Figure 2-13 Cisco 7600 ES+ 40G3C Line Card Faceplate

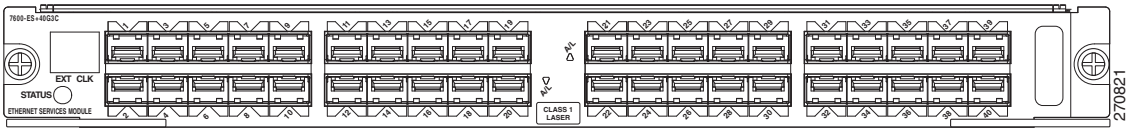


Figure 2-14 Cisco 7600 ES+ 40G3CXL Line Card Faceplate

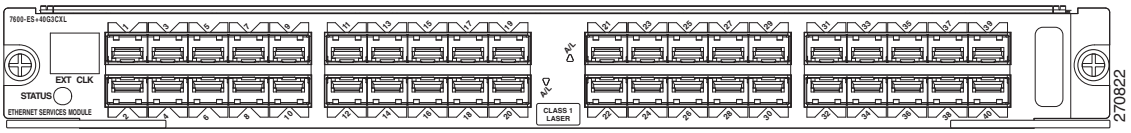


Table 2-18 provides LED descriptions.

Table 2-18 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Physical Specifications

The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line card physical specifications are shown in Table 2-19.

Table 2-19 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Memory Options

Table 2-20 lists the memory options available for the Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards:

Table 2-20 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 ES+ 40G3C	1 GB
Cisco 7600 ES+ 40G3CXL	2 GB

Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Supported SFP Modules

The Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-21.

Table 2-21 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)

Table 2-21 Cisco 7600 ES+ 40G3C, 7600 ES+ 40G3CXL Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

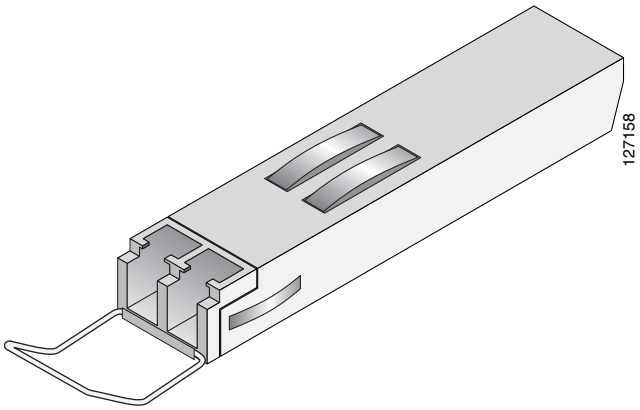
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-15 shows a typical SFP module.

Figure 2-15 SFP Optics Module



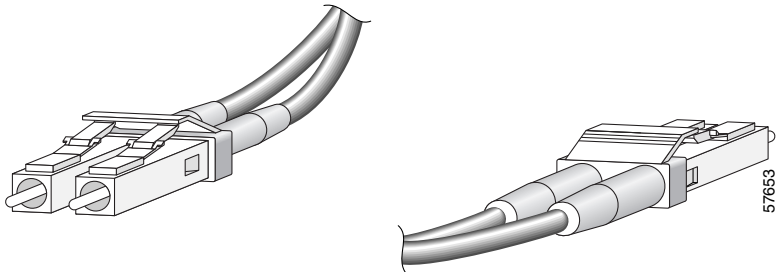
Connectors and Cabling

The SFP optical transceiver module on the Cisco 7600 ES+ 40G3C, -3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-16.

Figure 2-16 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XT-2TG3CX line cards:

- Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Processors, page 2-24
- Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card LEDs, page 2-24
- Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Physical Specifications, page 2-25
- Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Memory Options, page 2-26
- Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Supported XFP Modules, page 2-26

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Processors

The processors on the Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line card are listed in Table 2-22.

Table 2-22 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card LEDs

The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-17 and Figure 2-18.

Figure 2-17 Cisco 76-ES+XT-2TG3C Line Card Faceplate

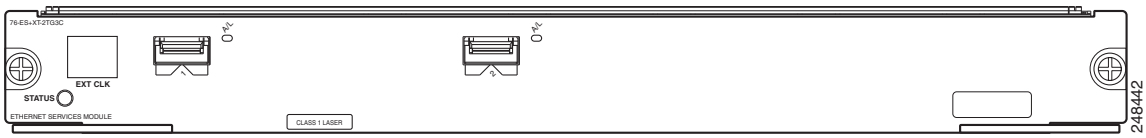


Figure 2-18 Cisco 76-ES+XT-2TG3CXL Line Card Faceplate

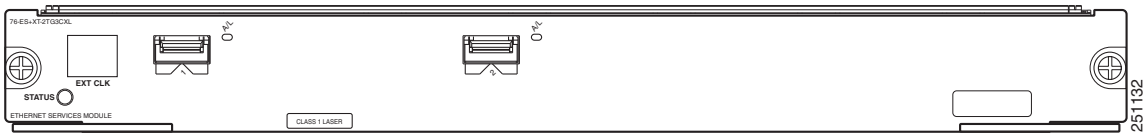


Table 2-23 provides LED descriptions.

Table 2-23 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Physical Specifications

The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line card physical specifications are shown in Table 2-24.

Table 2-24 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Memory Options

Table 2-25 lists the memory options available for the Cisco 76-ES+XT-2TG3CXL line cards:

Table 2-25 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XT-2TG3C	1GB
Cisco 76-ES+XT-2TG3CXL	2 GB

Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Supported XFP Modules

The Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL line cards support the XFP modules listed in Table 2-26.

Table 2-26 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)

Table 2-26 Cisco 76-ES+XT-2TG3C, 76-ES+XT-2TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

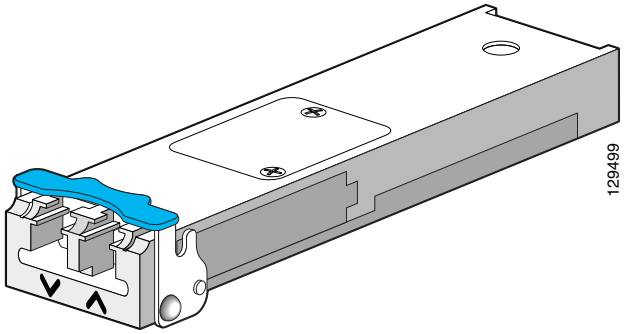
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-19 shows a typical XFP module.

Figure 2-19 XFP Module



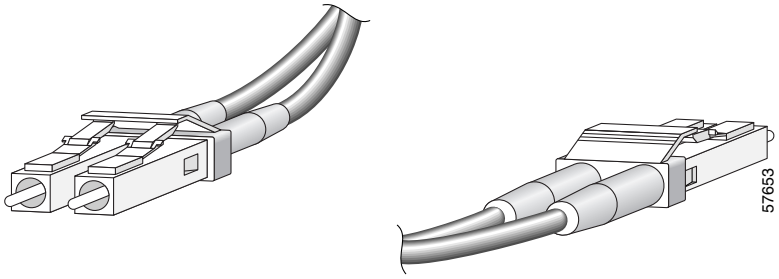
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ XT-2TG3C, 7600 ES+XT-2TG3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-20 shows the cable type for use with the XFP optical transceiver module on the Cisco 7600 ES+XT-2TG3C, 7600 ES+ XT-2TG3CXL line cards.

Figure 2-20 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards:

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Processors

The processors on the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line card are listed in Table 2-27.

Table 2-27 Cisco 7600 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card LEDs

The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-21and Figure 2-22.

Figure 2-21 Cisco 76-ES+XT-4TG3C Line Card Faceplate

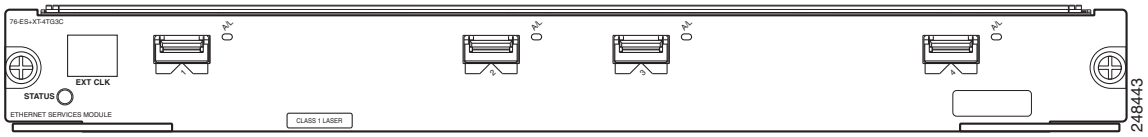


Figure 2-22 Cisco 76-ES+XT-4TG3CXL Line Card Faceplate

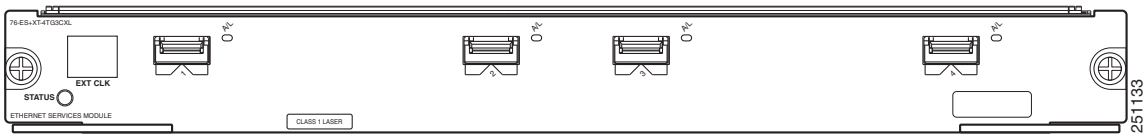


Table 2-28 provides LED descriptions.

Table 2-28 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Physical Specifications

The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line card physical specifications are shown in Table 2-29.

Table 2-29 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Memory Options

Table 2-30 lists the memory options available for the Cisco 7600 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards:

Table 2-30 Cisco 7600 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 7600 76-ES+XT-4TG3C	1 GB
Cisco 7600 76-ES+XT-4TG3CXL	2 GB

Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Supported SFP Modules

The Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards support the XFP modules listed in Table 2-31.

Table 2-31 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)

Table 2-31 Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

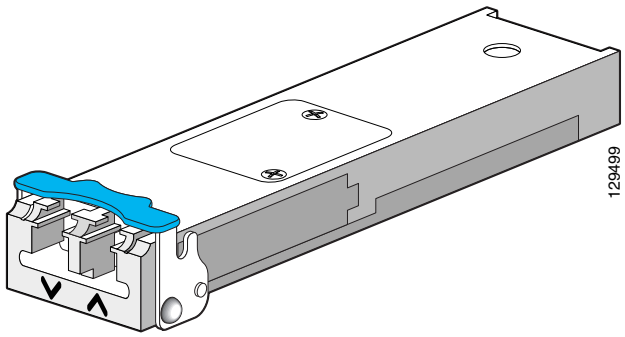
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-3 shows a typical XFP module.

Figure 2-23 XFP Module



Connectors and Cabling

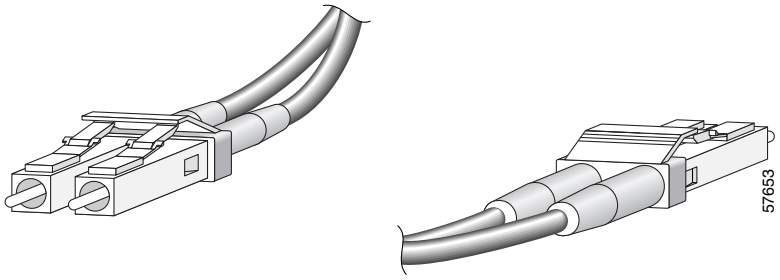
The XFP optical transceiver module on the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable

- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-4 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+XT-4TG3C, 76-ES+XT-4TG3CXL line cards.

Figure 2-24 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-20G Line Card Overview

The following sections describe the Cisco 76-ES+T-20G line cards:

- Cisco 76-ES+T-20G Line Card Processors, page 2-33
- Cisco 76-ES+T-20G Line Card LEDs, page 2-34
- Cisco 76-ES+T-20G Physical Specifications, page 2-34
- Cisco 76-ES+T-20G Line Card Memory Options, page 2-35
- Cisco 76-ES+T-20G Supported SFP Modules, page 2-35

Cisco 76-ES+T-20G Line Card Processors

The processors on the Cisco 76-ES+T-203CXLG line cards are listed in Table 2-32.

Table 2-32 Cisco 76-ES+T-20G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-20G Line Card LEDs

The Cisco 76-ES+T-20G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-25 and Table 2-33.

Figure 2-25 Cisco 76-ES+T-20G Line Card Faceplate

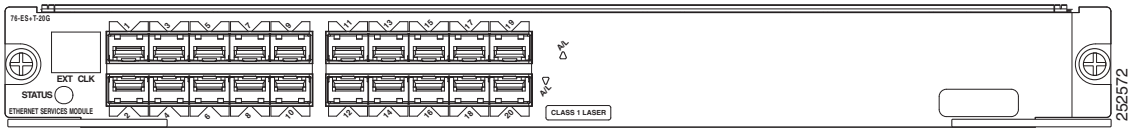


Table 2-33 provides LED descriptions.

Table 2-33 Cisco 76-ES+T-20G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-20G Physical Specifications

The Cisco 76-ES+T-20G line card physical specifications are shown in Table 2-34.

Table 2-34 Cisco 76-ES+T-20G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-20G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-20G Line Card Memory Options

Table 2-35 lists the memory options available for the Cisco 76-ES+T-20G line cards:

Table 2-35 Cisco 76-ES+T-20GLine Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-20G	2 GB

Cisco 76-ES+T-20G Supported SFP Modules

The Cisco 76-ES+T-20G line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-36

Table 2-36 Cisco 76-ES+T-20G Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)

Table 2-36 Cisco 76-ES+T-20G Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

- Height 0.03 in. (8.5 mm)

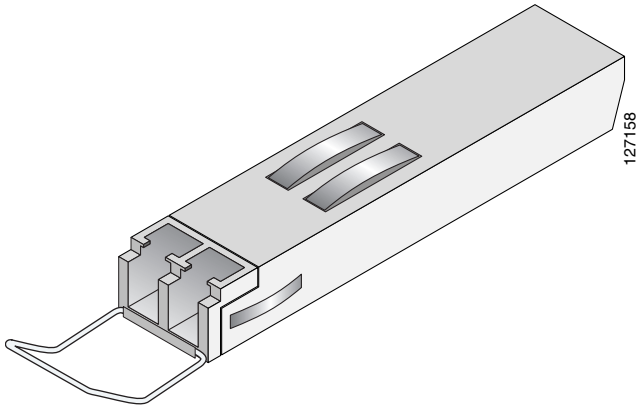
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-26 shows a typical SFP module.

Figure 2-26 SFP Optics Module



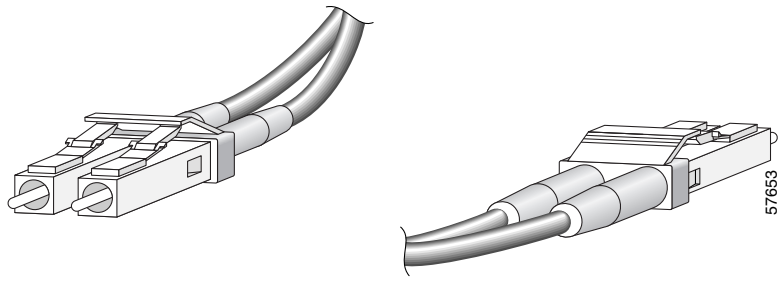
Connectors and Cabling

The SFP optical transceiver module on the Cisco 76-ES+T-20G line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-27.

Figure 2-27 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-40G Line Card Overview

The following sections describe the Cisco 76-ES+T-40G line cards:

Cisco 76-ES+T-40G Line Card Processors

The processors on the Cisco 76-ES+T-40G line card are listed in Table 2-37.

Table 2-37 Cisco 76-ES+T-40G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-40G Line Card LEDs

The Cisco 76-ES+T-40G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-28 and Table 2-38.

Figure 2-28 Cisco 76-ES+T-40G Line Card Faceplate

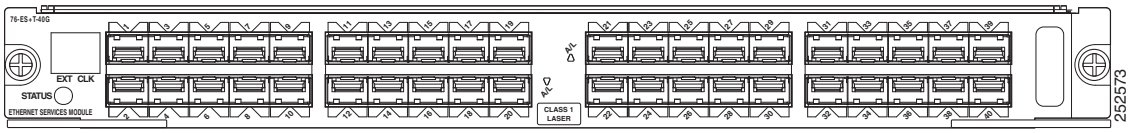


Table 2-38 Cisco 76-ES+T-40G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-40G Physical Specifications

The Cisco 76-ES+T-40G line card physical specifications are shown in Table 2-39.

Table 2-39 Cisco 76-ES+T-40G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-40G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-40G Line Card Memory Options

Table 2-40 lists the memory options available for the Cisco 7600 ES+ 40G3C, -40G3CXL line cards:

Table 2-40 Cisco 7600 ES+ T-40G Line Card Memory Options

Line Card	Memory Options
76-ES+T-40G	2 GB

Cisco 76-ES+T-40G Supported SFP Modules

The Cisco 76-ES+T-40G line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-41.

Table 2-41 Cisco 76-ES+T-40G Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)

Table 2-41 Cisco 76-ES+T-40G Supported SFP Modules (continued)

SFP Modules	Description
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

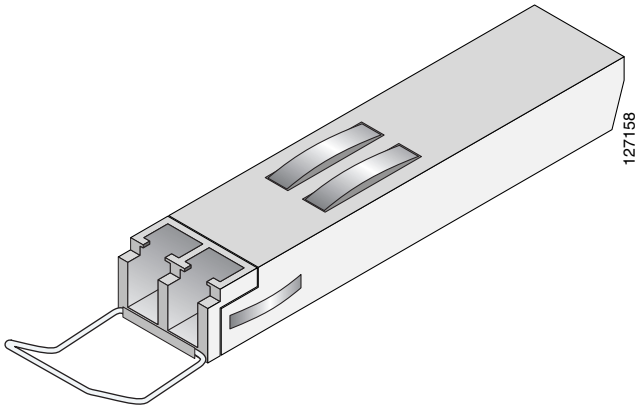
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-29 shows a typical SFP module.

Figure 2-29 SFP Optics Module



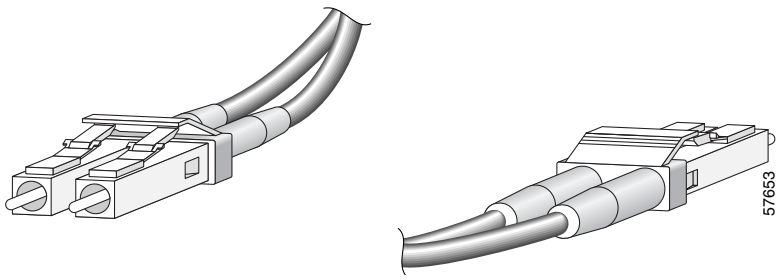
Connectors and Cabling

The SFP optical transceiver module on the Cisco 76-ES+T-40G line card requires dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-30.

Figure 2-30 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-2TG Line Card Overview

The following sections describe the Cisco 76-ES+T-2TG line cards:

- Cisco 76-ES+T-2TG Line Card Processors, page 2-43

Cisco 76-ES+T-2TG Line Card Processors

The processors on the Cisco 76-ES+T-2TG line card are listed in Table 2-42.

Table 2-42 Cisco 76-ES+T-2TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-2TG Line Card LEDs

The Cisco 76-ES+T-2TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-31.

Figure 2-31 Cisco 76-ES+T-2TG Line Card Faceplate

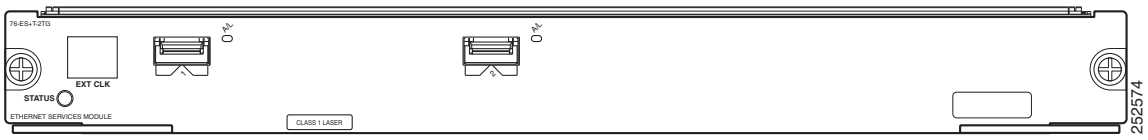


Table 2-43 provides LED descriptions.

Table 2-43 Cisco 76-ES+T-2TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-2TG Physical Specifications

The Cisco 76-ES+T-2TG line card physical specifications are shown in Table 2-44.

Table 2-44 Cisco 76-ES+T-2TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-2TG line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-2TG Line Card Memory Options

Table 2-45 lists the memory options available for the Cisco 76-ES+T-2TG line cards:

Table 2-45 Cisco 76-ES+T-2TGCXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-2TG	2 GB

Cisco 76-ES+T-2TG Supported XFP Modules

The Cisco 76-ES+T-2TG line card supports the XFP modules listed in Table 2-46.

Table 2-46 Cisco 76-ES+T-2TG Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)

Table 2-46 Cisco 76-ES+T-2TG Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

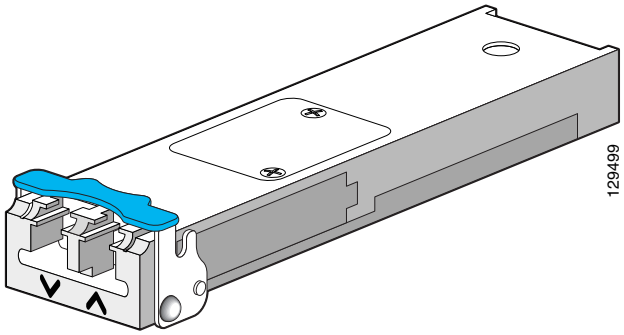
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-32 shows a typical XFP module.

Figure 2-32 XFP Module



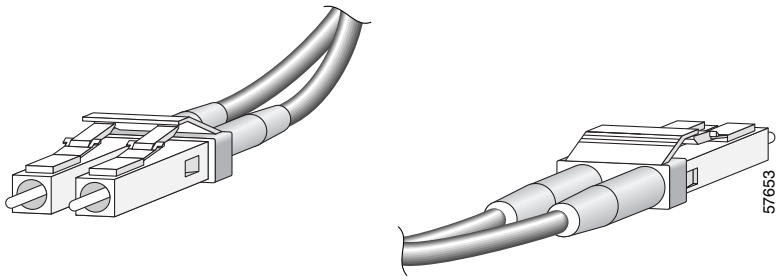
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T-2TG line card requires dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-33 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+T-2TG card.

Figure 2-33 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-4TG Line Card Overview

The following sections describe the Cisco 76-ES+T-4TG line cards:

Cisco 76-ES+T-4TG Line Card Processors

The processors on the Cisco 76-ES+T-4TG line card are listed in Table 2-47.

Table 2-47 Cisco 76-ES+T-4TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-4TG Line Card LEDs

The Cisco 76-ES+T-4TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-34.

Figure 2-34 Cisco 76-ES+T-4TG Line Card Faceplate

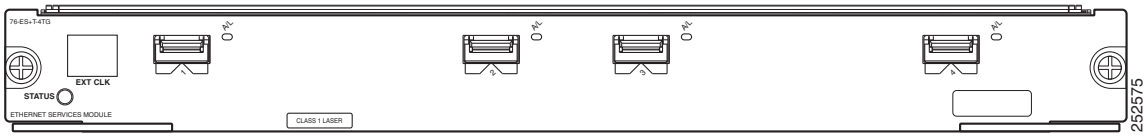


Table 2-48 provides LED descriptions.

Table 2-48 Cisco 76-ES+T-4TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.

Table 2-48 Cisco 76-ES+T-4TG Line Card LEDs (continued)

LED Label	Color	State	Meaning
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-4TG Physical Specifications

The Cisco 76-ES+T-4TG line card physical specifications are shown in Table 2-49.

Table 2-49 Cisco 76-ES+T-4TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-4TG line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-4TG Line Card Memory Options

Table 2-50 lists the memory options available for the Cisco 76-ES+T-4TG line cards:

Table 2-50 Cisco 76-ES+T-4TG Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-4TG	2 GB

Cisco 76-ES+T-4TG Supported XFP Modules

The Cisco 76-ES+T-4TG line cards support the XFP modules listed in Table 2-51.

Table 2-51 Cisco 76-ES+T-4TG Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF

Table 2-51 Cisco 76-ES+T-4TG Supported XFP Modules (continued)

XFP	Description
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)

Table 2-51 Cisco 76-ES+T-4TG Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

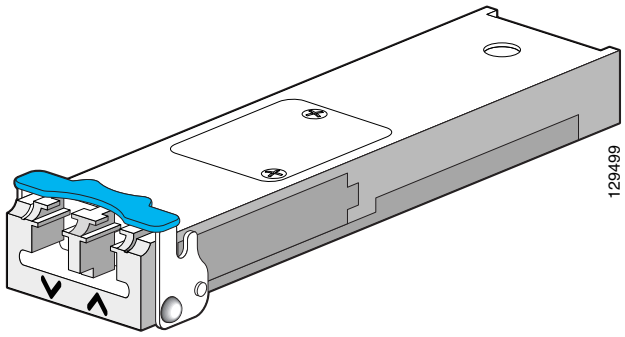
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-35 shows a typical XFP module.

Figure 2-35 XFP Module



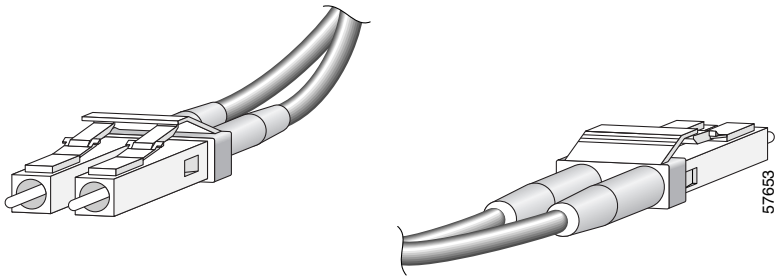
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T-4TG line card requires dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-36 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+T-4TG line card.

Figure 2-36 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards:

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Processors

The processors on the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards are listed in Table 2-52.

Table 2-52 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card LEDs

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-37 and Figure 2-38.

Figure 2-37 Cisco 76-ES+XC-20G3C Line Card Faceplate

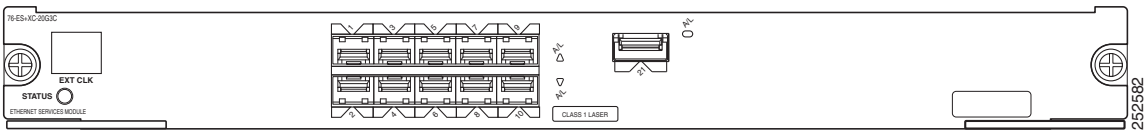


Figure 2-38 Cisco 76-ES+XC-20G3CXL Line Card Faceplate

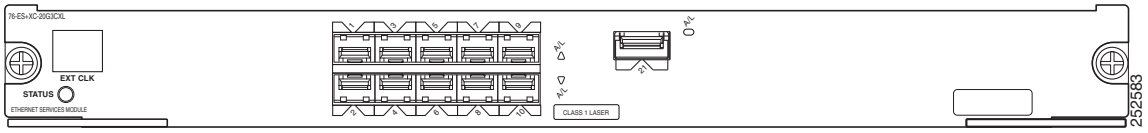


Table 2-53 provides LED descriptions.

Table 2-53 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Physical Specifications

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card physical specifications are shown in Table 2-54.

Table 2-54 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Memory Options

Table 2-55 lists the memory options available for the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards:

Table 2-55 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XC-20G3C	1 GB
Cisco 76-ES+XC-20G3CXL	2 GB

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported SFP Modules

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-56

Table 2-56 Cisco 7600-76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)

Table 2-56 Cisco 7600-76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported SFP Modules

SFP Modules	Description
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

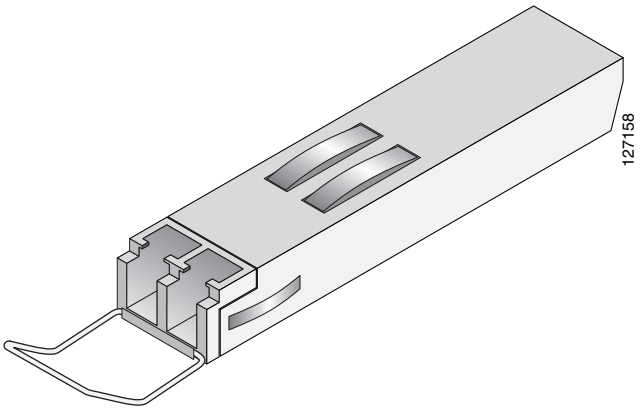
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-39 shows a typical SFP module.

Figure 2-39 SFP Optics Module



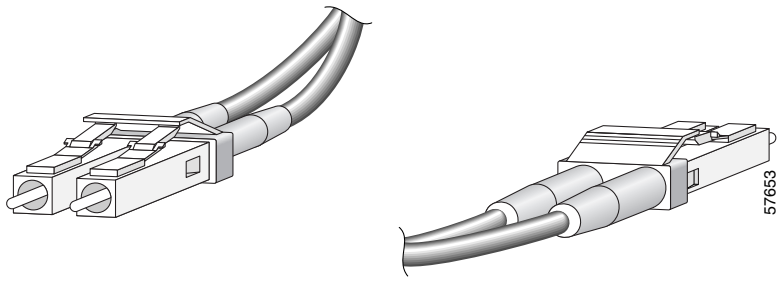
Connectors and Cabling

The SFP optical transceiver module on the Cisco 7600-ES+20G3C, -3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-40.

Figure 2-40 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported XFP Modules

The Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card supports the XFP modules listed in Table 2-57.

Table 2-57 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)

Table 2-57 Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

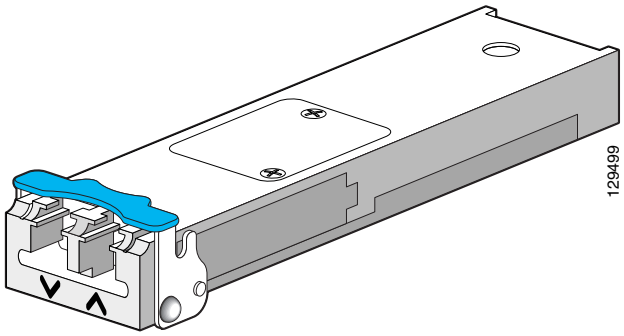
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-41 shows a typical XFP module.

Figure 2-41 XFP Module



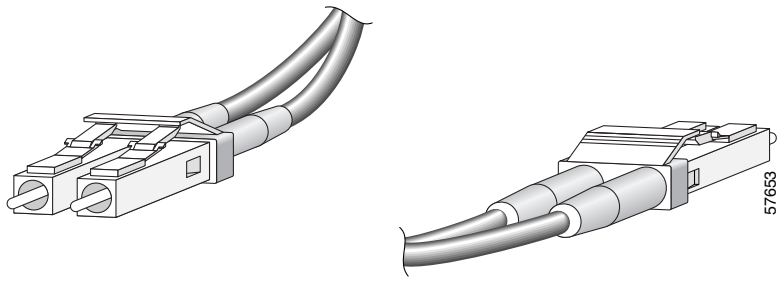
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-42 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL line card.

Figure 2-42 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Overview

The following sections describe the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards:

- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Processors, page 2-59
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card LEDs, page 2-59
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Physical Specifications, page 2-60
- Cisco 76-ES+XC-20G3C, 76-ES+XC-20G3CXL Line Card Memory Options, page 2-53
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules, page 2-61
- Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules, page 2-64

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Processors

The processors on the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards are listed in Table 2-58.

Table 2-58 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card LEDs

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-43 and Figure 2-44.

Figure 2-43 Cisco 76-ES+XC-40G3C Line Card Faceplate

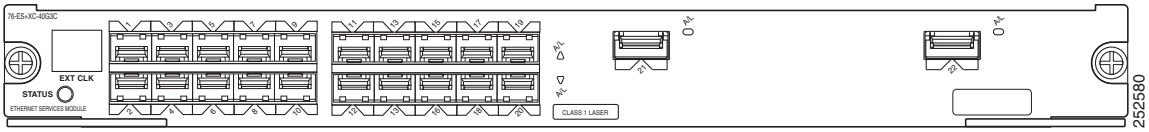


Figure 2-44 Cisco 76-ES+XC-40G3CXL Line Card Faceplate

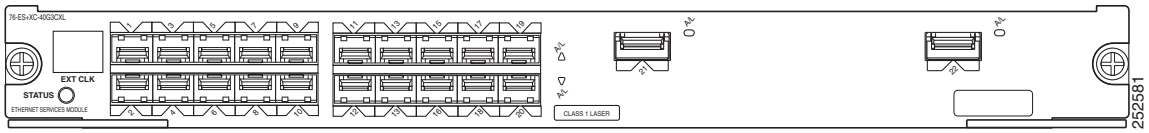


Table 2-59 provides LED descriptions.

Table 2-59 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Physical Specifications

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card physical specifications are shown in Table 2-60.

Table 2-60 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards occupy one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Memory Options

Table 2-61 lists the memory options available for the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards:

Table 2-61 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XC-40G3C	1 GB
Cisco 76-ES+XC-40G3CXL	2 GB

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line cards support the small form-factor pluggable (SFP) optical transceiver modules listed in Table 2-62

Table 2-62 Cisco 7600-76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules

SFP Modules	Description
SFP-GE-S	1000BASE-SX short wavelength; with DOM
SFP-GE-L	1000BASE-LX/LH short wavelength; with DOM
SFP-GE-Z	1000BASE-ZX; with DOM
SFP-GE-T	1000BASE-T SFP
GLC-BX-D	1000BASE-BX10-D downstream bidirectional single fiber; with DOM
GLC-BX-U	1000BASE-BX10-U upstream bidirectional single fiber; with DOM
CWDM-SFP-1470	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1490	Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1510	Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1530	Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1550	Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1570	Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1590	Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC
CWDM-SFP-1610	Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC
DWDM-SFP-3033	1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)
DWDM-SFP-3112	1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-3190	1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)
DWDM-SFP-3268	1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)
DWDM-SFP-3425	1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)
DWDM-SFP-3504	1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)
DWDM-SFP-3582	1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)
DWDM-SFP-3661	1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3819	1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)

Table 2-62 Cisco 7600-76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported SFP Modules

SFP Modules	Description
DWDM-SFP-3898	1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-3977	1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)
DWDM-SFP-4056	1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)
DWDM-SFP-4214	1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)
DWDM-SFP-4294	1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-4373	1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)
DWDM-SFP-4453	1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)
DWDM-SFP-4612	1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-4692	1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-4772	1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-4851	1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)
DWDM-SFP-5012	1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)
DWDM-SFP-5092	1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)
DWDM-SFP-5172	1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)
DWDM-SFP-5252	1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)
DWDM-SFP-5413	1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)
DWDM-SFP-5494	1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)
DWDM-SFP-5575	1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)
DWDM-SFP-5655	1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)
DWDM-SFP-5817	1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)
DWDM-SFP-5898	1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)
DWDM-SFP-5979	1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)
DWDM-SFP-6061	1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)
DWDM-SFP-3346	DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)
DWDM-SFP-3739	DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)
DWDM-SFP-4134	DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)
DWDM-SFP-4532	DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-4931	DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)
DWDM-SFP-5332	DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)
DWDM-SFP-5736	DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)
DWDM-SFP-6141	DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)

SFPs are integrated fiber-optic transceivers that provide high-speed serial links from a port or slot to the network. Various latching mechanisms can be used on the SFPs. There is no correlation between the type of latch to the model type (such as SX or LX/LH) or technology type (such as Gigabit Ethernet). See the label on the SFP for the technology type and model.

SFP dimensions are:

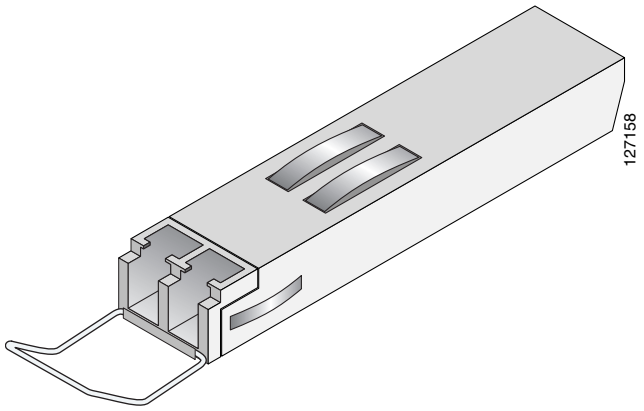
- Height 0.03 in. (8.5 mm)
- Width 0.53 in. (13.4 mm)
- Depth 2.22 in. (56.5 mm)

SFP temperature ranges are:

- COM—Commercial operating temperature range -5 to 70 degrees C (23 to 158 degrees F)
- EXT—Extended operating temperature range -5 to 85 degrees C (23 to 185 degrees F)
- IND—Industrial operating temperature range -40 to 85 degrees C (-40 to 85 degrees F)

Figure 2-45 shows a typical SFP module.

Figure 2-45 SFP Optics Module



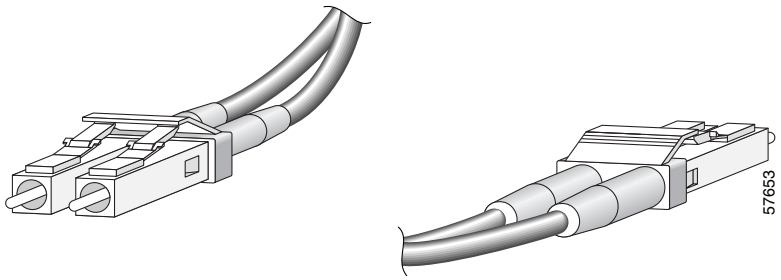
Connectors and Cabling

The SFP optical transceiver module on the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card require dual or single LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

For single-mode and multimode optical fiber connections, you can use either a duplex LC-type cable or two simplex LC-type cables, one for transmit (TX) and one for receive (RX). See Figure 2-46.

Figure 2-46 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules

The Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card supports the XFP modules listed in Table 2-63.

Table 2-63 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)

Table 2-63 Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

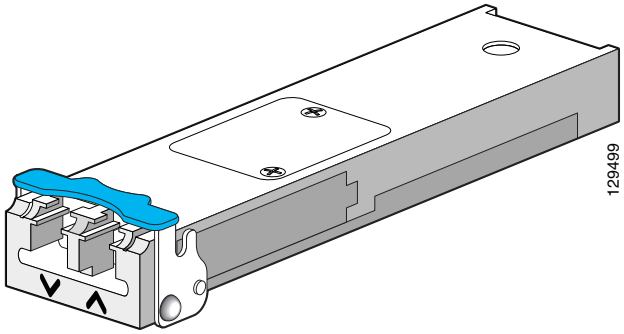
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-47 shows a typical XFP module.

Figure 2-47 XFP Module



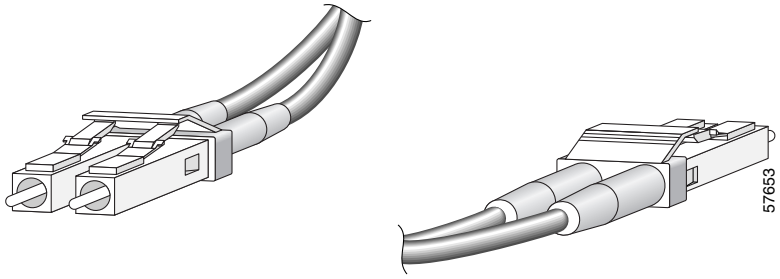
Connectors and Cabling

The XFP optical transceiver module on the Cisco 7600 ES+ 2TG3C, 7600 ES+ 2TG3CXL line card require dual LC/PC connectors. Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Singlemode Optical Connectors and Jumper Assemblies
- GR-1435-CORE: Generic Requirements for Multi-Fiber Optical Connectors

Figure 2-48 shows the cable type for use with the XFP optical transceiver module on the Cisco 76-ES+XC-40G3C, 76-ES+XC-40G3CXL line card.

Figure 2-48 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T+XC-20G Line Card Overview

The following sections describe the Cisco 76-ES+T+XC-20G line cards:

- Cisco 76-ES+T+XC-20G Supported XFP Modules, page 2-68

Cisco 76-ES+T+XC-20G Line Card Processors

The processors on the Cisco 76-ES+T+XC-20G line card are listed in Table 2-64.

Table 2-64 Cisco 76-ES+T+XC-20G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T+XC-20G Line Card LEDs

The Cisco 76-ES+T+XC-20G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-49.

Figure 2-49 Cisco 76-ES+T+XC-20G Line Card Faceplate

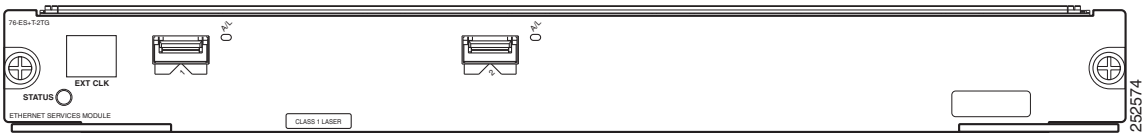


Table 2-65 provides LED descriptions.

Table 2-65 Cisco 76-ES+T+XC-20G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T+XC-20G Physical Specifications

The Cisco 76-ES+T+XC-20G line card physical specifications are shown in Table 2-66.

Table 2-66 Cisco 76-ES+T+XC-20G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T+XC-20G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T+XC-20G Line Card Memory Options

Table 2-67 lists the memory options available for the Cisco 76-ES+T+XC-20G line cards:

Table 2-67 Cisco 76-ES+T+XC-20G Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T+XC-20G	2 GB

Cisco 76-ES+T+XC-20G Supported XFP Modules

The Cisco 76-ES+T+XC-20G line card supports the XFP modules listed in Table 2-68.

Table 2-68 Cisco 76-ES+T+XC-20G Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)

Table 2-68 Cisco 76-ES+T+XC-20G Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) ona single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data, and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier, and passes it to an output driver.

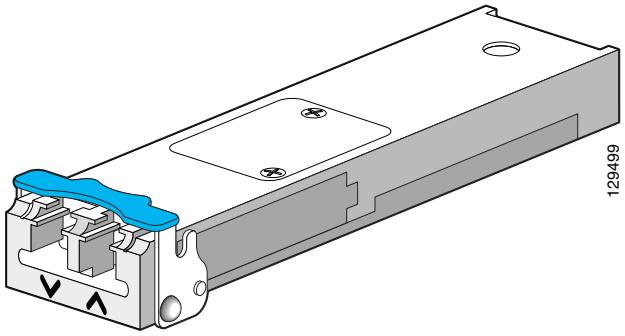
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-50 shows a typical XFP module.

Figure 2-50 XFP Module



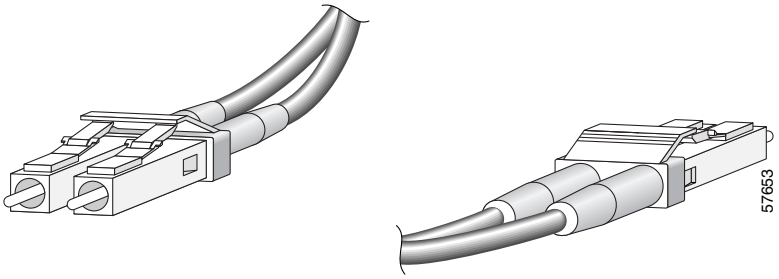
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T+XC-20G line card requires dual LC or PC connectors. Only the patch cord connections with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic requirements for optical fiber and optical fiber cable.
- GR-326-CORE: Generic requirements for singlemode optical connectors and jumper assemblies.
- GR-1435-CORE: Generic requirements for multi-fiber optical connectors.

Figure 2-51 shows the cable type used with the XFP optical transceiver module on the Cisco 76-ES+T+XC-20G card.

Figure 2-51 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T+XC-40G Line Card Overview

The following sections describe the Cisco 76-ES+T+XC-40G line cards:

- Cisco 76-ES+T+XC-40G Line Card Processors, page 2-71

Cisco 76-ES+T+XC-40G Line Card Processors

The processors on the Cisco 76-ES+T+XC-40G line card are listed in Table 2-69.

Table 2-69 Cisco 76-ES+T+XC-40G Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local control processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T+XC-40G Line Card LEDs

The Cisco 76-ES+T+XC-40G line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-52.

Figure 2-52 Cisco 76-ES+T+XC-40G Line Card Faceplate

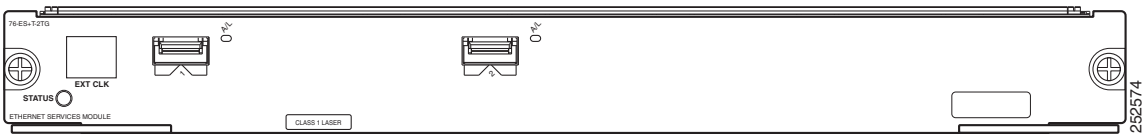


Table 2-70 provides LED descriptions.

Table 2-70 Cisco 76-ES+T+XC-40G Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T+XC-40G Physical Specifications

The Cisco 76-ES+T+XC-40G line card physical specifications are shown in Table 2-71.

Table 2-71 Cisco 76-ES+T+XC-40G Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T+XC-40G line card occupies one module slot and can be operated in all Cisco 7600 series routers except the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T+XC-40G Line Card Memory Options

Table 2-72 lists the memory options available for the Cisco 76-ES+T+XC-40G line cards:

Table 2-72 Cisco 76-ES+T+XC-40G Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T+XC-40G	2 GB

Cisco 76-ES+T+XC-40G Supported XFP Modules

The Cisco 76-ES+T+XC-40G line card supports the XFP modules listed in Table 2-73.

Table 2-73 Cisco 76-ES+T+XC-40G Supported XFP Modules

XFP	Description
XFP-10GLR-OC192SR	Cisco Multirate 10GBASE-LR and OC-192/STM-64 SR-1 XFP Module for SMF
XFP-10GZR-OC192LR	Cisco Multirate 10GBASE-ZR and OC-192/STM-64 lR-2 XFP Module for SMF
XFP-10GER-192IR+	Cisco Multirate 10GBASE-ER and OC-192/STM-64 IR-2 XFP Module for SMF
XFP-10GLR-OC192SR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
XFP-10GLR-OC192IR-L	Cisco Multirate 10GBASE-LR Ethernet and OC-192/STM-64 low power XFP Module for SMF
DWDM-XFP-60.61	DWDM XFP 1560.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-59.79	DWDM XFP 1559.79 nm XFP (100 GHz ITU grid)
DWDM-XFP-58.98	DWDM XFP 1558.98 nm XFP (100 GHz ITU grid)

Table 2-73 Cisco 76-ES+T+XC-40G Supported XFP Modules (continued)

XFP	Description
DWDM-XFP-58.17	DWDM XFP 1558.17 nm XFP (100 GHz ITU grid)
DWDM-XFP-56.55	DWDM XFP 1556.55 nm XFP (100 GHz ITU grid)
DWDM-XFP-55.75	DWDM XFP 1555.75 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.94	DWDM XFP 1554.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-54.13	DWDM XFP 1554.13 nm XFP (100 GHz ITU grid)
DWDM-XFP-52.52	DWDM XFP 1552.52 nm XFP (100 GHz ITU grid)
DWDM-XFP-51.72	DWDM XFP 1551.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.92	DWDM XFP 1550.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-50.12	DWDM XFP 1550.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-48.51	DWDM XFP 1548.51 nm XFP (100 GHz ITU grid)
DWDM-XFP-47.72	DWDM XFP 1547.72 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.92	DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)
DWDM-XFP-46.12	DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-44.53	DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)
DWDM-XFP-43.73	DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.94	DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)
DWDM-XFP-42.14	DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)
DWDM-XFP-40.56	DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)
DWDM-XFP-39.77	DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.98	DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)
DWDM-XFP-38.19	DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)
DWDM-XFP-36.61	DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.82	DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)
DWDM-XFP-35.04	DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)
DWDM-XFP-34.25	DWDM XFP 1534.25 nm XFP (100 GHz ITU grid)
DWDM-XFP-32.68	DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.90	DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)
DWDM-XFP-31.12	DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)
DWDM-XFP-30.33	DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) ona single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data, and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier, and passes it to an output driver.

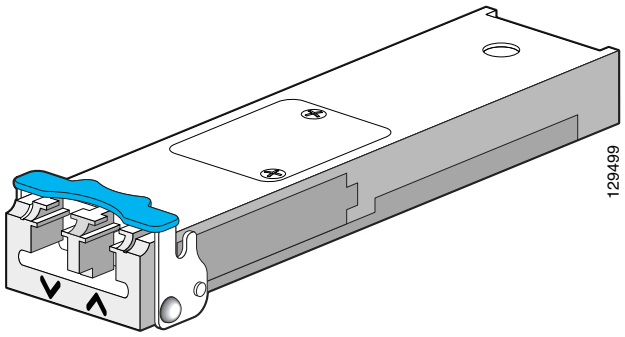
See the label on the XFP module for technology type and model.

XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

The XFP module temperature range is 0°C to 70°C. Figure 2-32 shows a typical XFP module.

Figure 2-53 XFP Module



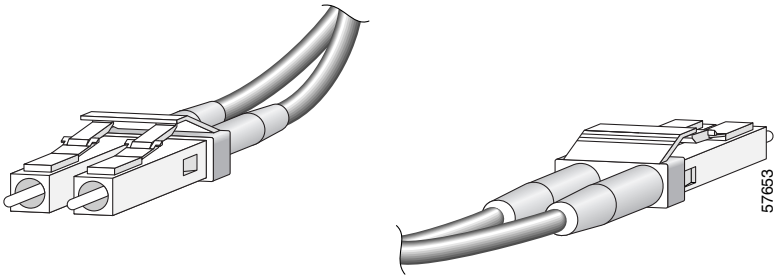
Connectors and Cabling

The XFP optical transceiver module on the Cisco 76-ES+T+XC-40G line card requires dual LC or PC connectors. Only the patch cord connections with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified below:

- GR-20-CORE: Generic requirements for optical fiber and optical fiber cable.
- GR-326-CORE: Generic requirements for singlemode optical connectors and jumper assemblies.
- GR-1435-CORE: Generic requirements for multi-fiber optical connectors.

Figure 2-54 shows the cable type used with the XFP optical transceiver module on the Cisco 76-ES+T+XC-40G card.

Figure 2-54 Duplex LC-Type Cable and Connector



For additional information on Cisco Transceiver Modules, see http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Cisco 76-ES+T-8TG Line Card Overview

The following sections describe the Cisco 76-ES+T-8TG line cards:

Cisco 76-ES+T-8TG Line Card Processors

The processors on the Cisco 76-ES+T-8TG line card are listed in Table 2-74.

Table 2-74 Cisco 76-ES+T-8TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local Control Processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+T-8TG Line Card LEDs

The Cisco 76-ES+T-8TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-55.

Figure 2-55 Cisco 76-ES+T-8TG Line Card Faceplate

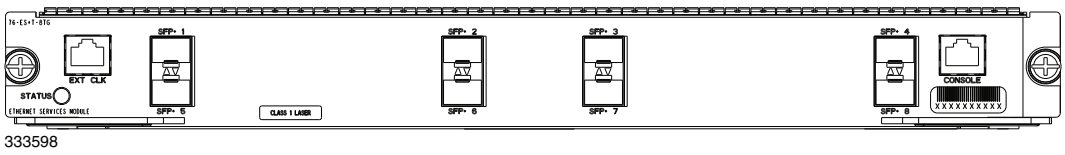


Table 2-75 provides LED description.

Table 2-75 Cisco 76-ES+T-8TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled, but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+T-8TG Physical Specifications

Table 2-76 lists the physical specifications of Cisco 76-ES+T-8TG line card.

Table 2-76 Cisco 76-ES+T-8TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+T-8TG line card occupies a single module slot and can be operated in all the Cisco 7600 series routers except for the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+T-8TG Line Card Memory Options

Table 2-77 lists the memory options available for the Cisco 76-ES+T-8TG line cards:

Table 2-77 Cisco 76-ES+T-8TG Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+T-8TG	2 GB

Cisco 76-ES+T-8TG Supported Features

The Cisco 76-ES+T-8TG line card supports all the features supported on a regular ES+ card, but at a lower scale suitable for a low queue deployment. The line card is limited to 16 queues per port. The following additional features are supported:

- Enhanced small form-factor pluggable (SFP+)

- Port Mapping: The ES+ HD has eight 10GE ports. The first port of each NP is numbered from 1 to 4 (NP 0 to NP 3), and each NP's second 10GE port is numbered from 5 to 8.
- Oversubscription: Theoretically each NP supports 15Gb on the egress side. For instance, 10Gb traffic is sent from the line card to NP, which has 5Gb of multicast and 5Gb of unicast traffic. Using loopback interface, the NP replicates the multicast packets and sends 5Gb traffic on each NP port. This traffic is divided into 2.5Gb on each port. So, effectively each NP port or interface receives 7.5Gb traffic. Since there are two 10Gb ports on each NP, the total rate achieved is 15Gb.

  On the ingress path, more than 10Gb is supported for higher packet size. For instance, when the NP receives the packets at the rate of 10Gb, and each packet size is 64 bytes, it will be 96 bytes (64 +32 byte DBUS header) when it moves from NP to line card. So, it consumes entire bandwidth and restrict the ingress traffic to 10Gb. If the packet size is greater than 64 bytes, it will give more than 10Gb throughput.

Cisco 76-ES+T-8TG Supported SFP+ Modules

The Cisco 76-ES+T-8TG line cards support the enhanced small form-factor pluggable (SFP+) optical transceiver modules listed in Table 2-78.

Table 2-78 Cisco 76-ES+T-8TG Supported SFP+ Modules

SFP+ Modules	Description
SFP-10G-SR-X	10GE SFP+, Short range.
SFP-10G-LR-X	10GE SFP+, Long range.

Cisco 76-ES+XT-8TG Line Card Overview

The following sections describe the Cisco 76-ES+XT-8TG line cards:

Cisco 76-ES+XT-8TG Line Card Processors

The processors on the Cisco 76-ES+XT-8TG line card are listed in Table 2-79.

Table 2-79 Cisco 76-ES+XT-8TG Line Card Processor

Type	Speed	Description
CPU	300 megahertz (MHz) internal operating frequency	Trident Processor
Local Control Processor	1333 MHz (1.3GHz)	MPC8548

Cisco 76-ES+XT-8TG Line Card LEDs

The Cisco 76-ES+XT-8TG line cards have Status and A/L (Active Loopback) LEDs, as shown in Figure 2-56.

Figure 2-56 Cisco 76-ES+XT-8TG Line Card Faceplate

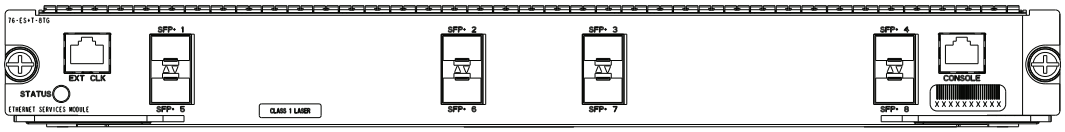


Table 2-80 provides LED description.

Table 2-80 Cisco 76-ES+XT-8TG Line Card LEDs

LED Label	Color	State	Meaning
STATUS	Red	On	The line card has encountered an error.
	Green	On	The line card is online.
	Yellow	On	The line card is loading.
	Off	Off	The line card is powered off.
A/L	Amber	On	The port is enabled, but there is not a valid Ethernet link.
	Green	On	The port is enabled and a valid Ethernet link has been established.
	Off	Off	The port is not enabled by software.

Cisco 76-ES+XT-8TG Physical Specifications

Table 2-81 lists the physical specifications of Cisco 76-ES+XT-8TG line card.

Table 2-81 Cisco 76-ES+XT-8TG Line Card Physical Specifications

Description	Specifications
Physical dimensions	The Cisco 76-ES+XT-8TG line card occupies a single module slot and can be operated in all the Cisco 7600 series routers except for the Cisco 7603 router.
Shipping weight	8 lb (3.64 kg)
Operating temperature	32 to 104°F (0 to 40°C)
Relative humidity	10 to 90 percent, noncondensing
Storage temperature	–4 to 149°F (–20 to 65°C)

Cisco 76-ES+XT-8TG Line Card Memory Options

Table 2-82 lists the memory options available for the Cisco 76-ES+XT-8TG line cards:

Table 2-82 Cisco 76-ES+XT-8TG Line Card Memory Options

Line Card	Memory Options
Cisco 76-ES+XT-8TG	2 GB

Cisco 76-ES+XT-8TG Supported SFP+ Modules

The Cisco 76-ES+XT-8TG line cards support the enhanced small form-factor pluggable (SFP+) optical transceiver modules listed in Table 2-83.

Table 2-83 Cisco 76-ES+XT-8TG Supported SFP+ Modules

SFP+ Modules	Description
SFP-10G-SR-X	10GE SFP+, Short range.
SFP-10G-LR-X	10GE SFP+, Long range.

CHAPTER 3

Preparing to Install a Cisco 7600 Series Ethernet Services Plus Line Card

This chapter describes the general equipment, safety, and site preparation requirements for installing a Cisco 7600 Series Ethernet Services + line card. This chapter contains the following sections:

Required Tools and Equipment

You need the following tools and parts to remove and install Cisco 7600 ES+ line cards. If you need additional equipment, contact a service representative.

- Cisco 7600 Series ES+ line card
- Interface cables to connect the Cisco 7600 ES+ line card with another router or switch
- Any SFP or XFP modules, or memory you need to install (and are not already installed)
- Number 1 Phillips and a 3/16-inch flat-blade screwdriver
- Number 2 Phillips screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or the ESD-preventive wrist or ankle strap and instructions supplied with your line card
- Antistatic mat
- Antistatic container
- Fiber-optic end-face cleaning tools and inspection equipment. For complete information on inspecting and cleaning fiber-optic connections, refer to the white-paper document at this URL: http://www.cisco.com/en/US/tech/tk482/tk607/technologies_white_paper09186a0080254eba.shtml

Safety Guidelines

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.

Warning Definition

Warning **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Waarschuwing **BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus **TÄRKEITÄ TURVALLISUUSOHJEITA**

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET

Attention **IMPORTANTES INFORMATIONS DE SÉCURITÉ**

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung **WICHTIGE SICHERHEITSHINWEISE**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza **IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI

Advarsel **VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE

Aviso **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES

¡Advertencia! **INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES

Varning! **VIKTIGA SÄKERHETSANVISNINGAR**

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR

FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmezeto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplo figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Предупреждение **ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ**

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ

警告 重要的安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

주의 중요 안전 지침

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

تحذير إرشادات الأمان الهامة

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في أخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز.

قم بحفظ هذه الإرشادات

Upozorenje **VAŽNE SIGURNOSNE NAPOMENE**

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.

SAČUVAJTE OVE UPUTE

Upozornění **DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

USCHOVEJTE TYTO POKYNY

Προειδοποίηση ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθεις πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

אזהרה

הוראות בטיחות חשובות

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כד לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה

Ostrzeżenie

WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA

Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.

NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ

Upozornenie

DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.

USCHOVAJTE SI TENTO NÁVOD

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. An Cisco 7600 Series ES+ line card comprises printed circuit boards that are fixed ina metal carrier. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

Laser/LED Safety

An optical single-mode transmitter uses a small laser to transmit the light signal to the network ring. Keep the transmit port covered whenever a cable is not connected to it. Although multimode transceivers typically use LEDs for transmission, it is good practice to keep open ports covered and avoid staring into open ports or apertures. The single-mode aperture port contains a laser warning label, as shown in Figure 3-1. The multimode aperture contains a Class 1 LED warning label, as shown in Figure 3-1. These warnings apply to SFP and XFP modules that transmit signals via an optical carrier signal.

Figure 3-1 Class 1 Laser Warning Labels for Single-Mode Port

Warning **Class 1 laser product.** Statement 1008

Warning **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

Waarschuwing **Losgekoppelde of losgeraakte glasvezels of aansluitingen kunnen onzichtbare laserstraling produceren. Kijk niet rechtstreeks in de straling en gebruik geen optische instrumenten rond deze glasvezels of aansluitingen.**

Varoitus **Irrotetuista kuiduista tai liittimistä voi tulla näkymätöntä lasersäteilyä. Älä tuijota säteitä tai katso niitä suoraan optisilla välineillä.**

Attention **Les fibres ou connecteurs débranchés risquent d'émettre des rayonnements laser invisibles à l'œil. Ne regardez jamais directement les faisceaux laser à l'œil nu, ni d'ailleurs avec des instruments optiques.**

Warnung **Unterbrochene Fasern oder Steckerverbindungenkönnen unsichtbare Laserstrahlung abgeben. Blicken Sie weder mit bloßem Auge noch mit optischen Instrumenten direkt in Laserstrahlen.**

Avvertenza **Le fibre ottiche ed i relativi connettori possono emettere radiazioni laser. I fasci di luce non devono mai essere osservati direttamente o attraverso strumenti ottici.**

Advarsel **Det kan forekomme usynlig laserstråling fra fiber eller kontakter som er frakoblet. Stirr ikke direkte inn i strålene eller se på dem direkte gjennom et optisk instrument.**

Aviso **Radiação laser invisível pode ser emitida de conectores ou fibras desconectadas. Não olhe diretamente para os feixes ou com instrumentos ópticos.**

¡Advertencia! **Es posible que las fibras desconectadas emitan radiación láser invisible. No fije la vista en los rayos ni examine éstos con instrumentos ópticos.**

Varning! **Osynlig laserstrålning kan avges från frånkopplade fibrer eller kontaktdon. Rikta inte blicken in i strålar och titta aldrig direkt på dem med hjälp av optiska instrument.**

A nem csatlakoztatott üvegszálak és csatlakozók láthatatlan lézersugárzást bocsáthatnak ki. Ne nézzen bele a sugárba, és ne nézze közvetlenül, optikai berendezések segítségével!

Предупреждение Отключенные световоды и разъемы могут испускать невидимое лазерное излучение. Не допускайте попадания лазерного луча в глаза и не смотрите на него через оптические приборы.

警告 断开的光纤或接头有可能发出不可见的激光辐射。请勿直视光束或直接用光学仪器观看光束。

警告 光ファイバ ケーブルまたはコネクタを取り外した状態では、目に見えないレーザー光が放射されていることがあります。光線をのぞきこんだり、光学機器を使用して光線を直接見たりしないでください。

주의 연결이 해제된 섬유나 커넥터에서 눈에 보이지 않는 레이저 방사열이 방출될 수 있습니다. 레이저 빔을 눈으로 쳐다 보거나 광학 기구를 사용하여 직접 보지 마십시오.

Aviso **Radiação laser invisível pode ser emitida a partir de fibras ou conectores desconectados. Não fixe o olhar nos feixes e nem olhe diretamente com instrumentos ópticos.**

Advarsel **Usynlig laserstråling kan forekomme fra brugte fibre eller stik. Stir ikke ind i stråler eller direkte med optiske instrumenter.**

تحذير **من المحتمل انبعاث أشعة الليزر من الألياف غير المتصلة أو التوصيلات. لا تحدق النظر في الشعاع أو النظر مباشرة بدون أي أداة بصرية.**

Upozornění **Odpojená vlákna kabelů či konektory mohou vyzařovat neviditelné laserové záření. Nedívejte se do paprsků ani nepozorujte přímo pomocí optických přístrojů.**

Προειδοποίηση Από αποσυνδεδεμένες ίνες ή υποδοχές μπορεί να εκπέμπεται αόρατη ακτινοβολία λέιζερ. Μην κοιτάτε απευθείας τις δέσμες φωτός και μην τις απεικονίζετε απευθείας με οπτικά όργανα.

אזהרה תתיכן פליטה של קרינת לייזר בלתי-נראית מסיבים או ממחברים מנותקים. אל תביט ישירות לתוך קרני אור ואל תביט באמצעות במכשירים אופטיים.

Opomena Невидливо ласерско зрачење може да зрачи од исклучените влакна или приклучоци. Не гледајте во зраци и не прегледувајте ги директно со оптички инструменти.

Ostrzeżenie **Odłączone światłowody lub złącza mogą emitować niewidzialne promieniowanie laserowe. Nie należy patrzeć prosto w wiązkę lasera ani bezpośrednio obserwować jej przy użyciu przyrządów optycznych.**

Upozornenie **Odpojené vlákna káblov alebo konektory môžu vyžarovať neviditeľné laserové žiarenie. Nepozerajte sa do lúčov ani ich nepozorujte priamo pomocou optických prístrojov.**

Warning **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051

Warning **Class 1 LED product.** Statement 1027

CHAPTER 4

Installing and Removing a Cisco 7600 Series Ethernet Services Plus Line Card

This chapter describes how to install or remove Cisco 7600 Series Ethernet Services + line cards on the Cisco 7600 series routers. This chapter contains the following sections:

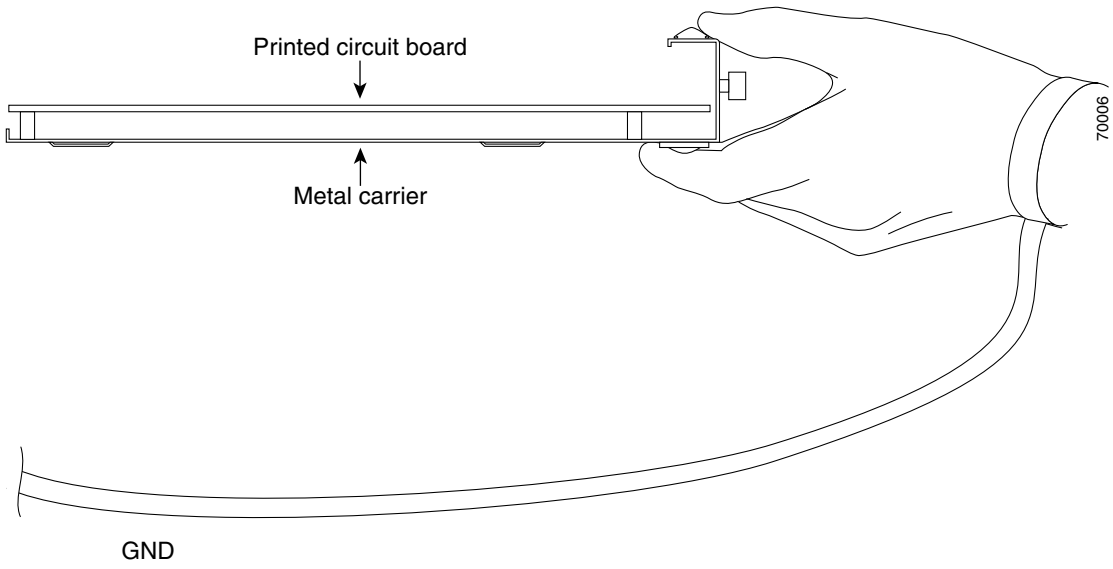
Handling Cisco 7600 Series Ethernet Services Plus Line Cards

Each Cisco 7600 Series ES+ line card circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage. Before you begin installation, read Chapter 3, "Preparing to Install a Cisco 7600 Series Ethernet Services Plus Line Card," for a list of parts and tools required for installation.

Caution Always handle the Cisco 7600 Series ES+ line card by the carrier edges and handle; never touch the line card components or connector pins. (See Figure 4-1.)

When a slot is not in use, a blank filler plate must be installed in the empty slot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a Cisco 7600 Series ES+ line card in a slot that is not in use, you must first remove the blank filler plate.

Figure 4-1 Handling a Cisco 7600 Series ES+ line card



Online Insertion and Removal

The Cisco 7600 series routers support online insertion and removal (OIR) of the Cisco 7600 Series ES+ line card, as well as OIR for the SFP or XFP modules. Therefore, you can remove a Cisco 7600 Series ES+ line card with its SFP or XFP modules still intact, or you can remove SFP or XFP modules independently from the Cisco 7600 Series ES+ line card, leaving the line card installed in the router.

Note The 40 port versions (7600-ES+40G3C and 7600-ES+40G3CXL) require longer maintenance time for card replacement.

This section includes the following topics on OIR support:

Preparing for Online Removal of a Cisco 7600 Series Ethernet Services Plus Line Card

The Cisco 7600 series routers support OIR of the Cisco 7600 Series ES+ line card. To do this, you can power down a Cisco 7600 Series ES+ line card (which automatically deactivates any installed SFP or XFP modules) and remove the Cisco 7600 Series ES+ line card with the SFP or XFP modules still intact.

Although graceful deactivation of a 7600 ES+ line card is preferred using the **no power enable module** command, the Cisco 7600 series routers do support removal of the 7600 ES+ line card without deactivating it first.

If you plan to remove a Cisco 7600 Series ES+ line card, you can deactivate the Cisco 7600 Series ES+ line card first, using the **no power enable module** global configuration command.

When you deactivate a Cisco 7600 Series ES+ line card using this command, it automatically deactivates each of the SFP or XFP modules that are installed in that Cisco 7600 Series ES+ line card. Therefore, it is not necessary to deactivate each of the SFP or XFP modules prior to deactivating the Cisco 7600 Series ES+ line card.

Caution When you replace a Cisco 7600 Series ES+ line card with a different type of Cisco 7600 Series ES+ line card, the configurations are not saved automatically.

Replacing a Cisco 7600 Series Ethernet Services Plus Line Card

1. Capture the health of the steady state system running the target IOS and traffic snapshot.
2. Use the **show run module** command to display the running configuration of the module.
3. Save the running configuration to a file using the **copy running-config tftp** command. You are prompted to provide the address of the TFTP server and the file name.
4. Power down the old card using the **no power enable module** command.
5. Remove the old card from the slot and disconnect all cables. See Deactivating a Cisco 7600 Series Ethernet Services Plus Line Card, page 4-3.
6. Replace with a new card in the same slot and reconnect all the cables disconnected in the previous step, with a 1:1 port correspondence.
7. Enable power to the slot using the **power enable module** command. See Reactivating a Cisco 7600 Series Ethernet Services Plus Line Card, page 4-4.
8. Copy and paste the running configuration saved in Step 3 on the new card.
9. Enable all the interfaces using the **no shut** command in interface configuration mode.
10. Capture another health snapshot and compare these results with the results noted in Step 1.
11. Perform Stateful Switchover (SSO) to ensure proper working of HA.
12. Perform generic health check.
13. Perform SSO to restore active or standby roles as before.

Deactivating a Cisco 7600 Series Ethernet Services Plus Line Card

To deactivate a 7600 ES+ Ethernet line card and its installed SFPs or XFPs prior to removal of the 7600 ES+ line card, use the following command in global configuration mode:

Command	Purpose
Router(config)# **no power enable module** *slot*	Shuts down any installed interfaces, and deactivates the 7600 ES+ line card in the specified slot, where: • *slot*—Specifies the chassis slot number where the 7600 ES+ line card is installed.

For more information about chassis slot numbering, refer to the "Identifying Slots and Subslots for the Cisco 7600 Cisco 7600 Series ES+ Line Cards" section on page 2-3 section in this guide.

Reactivating a Cisco 7600 Series Ethernet Services Plus Line Card

Once you deactivate a Cisco 7600 Series ES+ line card, whether or not you have performed an OIR, you must use the **power enable module** global configuration command to reactivate the Cisco 7600 Series ES+ line card.

If you did not issue a command to deactivate the SFP or XFP modules installed in a Cisco 7600 Series ES+ line card, but you did deactivate the Cisco 7600 Series ES+ line card using the **no power enable module** command, then you do not need to reactivate the SFP or XFP modules after an OIR of the Cisco 7600 Series ES+ line card. The installed SFP or XFP modules automatically reactivate upon reactivation of the Cisco 7600 Series ES+ line card in the router.

For example, consider the case where you remove a Cisco 7600 Series ES+ line card from the router to replace it with another Cisco 7600 Series ES+ line card. You reinstall the same SFP or XFP modules into the new Cisco 7600 Series ES+ line card. When you enter the **power enable module** command on the router, the SFP or XFP modules will automatically reactivate with the new Cisco 7600 Series ES+ line card.

To activate a Cisco 7600 Series ES+ line card and its installed SFP or XFP modules after the Cisco 7600 Series ES+ line card has been deactivated, use the following command in global configuration mode:

Command	Purpose
Router(config)# **power enable module** *slot*	Activates the ES+ line card in the specified slot and its installed SFPs or XFPs, where: • *slot*—Specifies the chassis slot number where the ES+ line card is installed.

For more information about chassis slot numbering, refer to the Identifying Slots and Subslots for the Cisco 7600 Cisco 7600 Series ES+ Line Cards, page 2-3 section in this guide.

Verifying Deactivation and Activation of a Cisco 7600 Series Ethernet Services Plus Line Card

To verify the deactivation of a 7600 ES+ line card, enter the **show module** command in privileged EXEC configuration mode. Observe the Status field associated with the 7600 ES+ line card that you want to verify.

The following example shows 7600 ES+ line cards located in slots 4 and 6. Slot 6 is powered down. This is indicated by its “PwrDown” status.

```
Router# show module
Mod Ports Card Type                                Model              Serial No.
--- ----- ---------------------------------------- ------------------ -----------
  1    24  CEF720 24 port 1000mb SFP                WS-X6724-SFP       SAL0930696R
  2    48  CEF720 48 port 10/100/1000mb Ethernet    WS-X6748-GE-TX     SAL0929634V
  3     0  4-subslot SPA Interface Processor-200    7600-SIP-200       JAB09270AEQ
  4    40  7600 ES+                                 7600-ES+40G3CXL    JAE1146355M
  5     2  Supervisor Engine 720 (Active)           WS-SUP720-3BXL     SAD085106Z7
  6     4  7600 ES+                                 7600-ES+4TG3C      JAE11518648

Mod MAC addresses                       Hw    Fw           Sw           Status
--- ----------------------------------- ------ ------------ ------------ -------
  1  0014.f212.0028 to 0014.f212.003f   2.2   12.2(14r)S5  12.2(nightly Ok
  2  0014.f211.f20c to 0014.f211.f23b   2.2   12.2(14r)S5  12.2(nightly Ok
```

```
  3  0014.a8f7.1c40 to 0014.a8f7.1c7f   1.1   12.2(nightly 12.2(nightly Ok
  4  001d.e5e8.1740 to 001d.e5e8.179f   0.301 12.2(33r)SRD 12.2(nightly Ok
  5  0011.21ba.9a48 to 0011.21ba.9a4b   4.1   8.4(2)       12.2(nightly Ok
  6  001d.e5e8.2e00 to 001d.e5e8.2e0f   0.301 12.2(33r)SRD 12.2(nightly PwrDown

Mod  Sub-Module                  Model              Serial       Hw     Status
---- --------------------------- ------------------ ------------ ------- -------
  1  Centralized Forwarding Card WS-F6700-CFC       SAL1021PB1F  2.0    Ok
  2  Centralized Forwarding Card WS-F6700-CFC       SAL085285LJ  2.0    Ok
 3/2 4xT3E3 SPA                  SPA-4XT3/E3        JAB09270B3J  1.0    Ok
  4  7600 ES+ DFC XL             7600-ES+3CXL       JAE11463519  0.200  Ok
  4  7600 ES+ 40xGE SFP          7600-ES+40G        JAE114632R4  0.300  Ok
  5  Policy Feature Card 3       WS-F6K-PFC3BXL     SAD0851042D  1.4    Ok
  5  MSFC3 Daughterboard         WS-SUP720          SAD085002WF  2.2    Ok
  6  7600 ES+ DFC LITE           7600-ES+3C                      0.301  PwrDown
  6  7600 ES+ 4x10GE XFP         7600-ES+4TG        JAE1151864W  0.201  PwrDown

Mod  Online Diag Status
---- -------------------
  1  Pass
  2  Pass
  3  Pass
 3/2 Pass
  4  Pass
  5  Pass
  6  Not Applicable
Router#
```

To verify activation and proper operation of a 7600 ES+ line card, enter the **show module** command and observe “Ok” in the Status field as shown in the following example:

```
Router# show module
Mod Ports Card Type                                  Model              Serial No.
--- ----- -------------------------------------- ------------------ -----------
  1   24  CEF720 24 port 1000mb SFP                WS-X6724-SFP       SAL0930696R
  2   48  CEF720 48 port 10/100/1000mb Ethernet    WS-X6748-GE-TX     SAL0929634V
  3    0  4-subslot SPA Interface Processor-200    7600-SIP-200       JAB09270AEQ
  4   40  7600 ES+                                 7600-ES+40G3CXL    JAE1146355M
  5    2  Supervisor Engine 720 (Active)           WS-SUP720-3BXL     SAD085106Z7
  6    4  7600 ES+                                 7600-ES+4TG3C      JAE11518648

Mod MAC addresses                       Hw    Fw           Sw           Status
--- ----------------------------------- ------ ------------ ------------ -------
  1  0014.f212.0028 to 0014.f212.003f   2.2   12.2(14r)S5  12.2(nightly Ok
  2  0014.f211.f20c to 0014.f211.f23b   2.2   12.2(14r)S5  12.2(nightly Ok
  3  0014.a8f7.1c40 to 0014.a8f7.1c7f   1.1   12.2(nightly 12.2(nightly Ok
  4  001d.e5e8.1740 to 001d.e5e8.179f   0.301 12.2(33r)SRD 12.2(nightly Ok
  5  0011.21ba.9a48 to 0011.21ba.9a4b   4.1   8.4(2)       12.2(nightly Ok
  6  001d.e5e8.2e00 to 001d.e5e8.2e0f   0.301 12.2(33r)SRD 12.2(nightly Ok

Mod  Sub-Module                  Model              Serial       Hw     Status
---- --------------------------- ------------------ ------------ ------- -------
  1  Centralized Forwarding Card WS-F6700-CFC       SAL1021PB1F  2.0    Ok
  2  Centralized Forwarding Card WS-F6700-CFC       SAL085285LJ  2.0    Ok
 3/2 4xT3E3 SPA                  SPA-4XT3/E3        JAB09270B3J  1.0    Ok
  4  7600 ES+ DFC XL             7600-ES+3CXL       JAE11463519  0.200  Ok
  4  7600 ES+ 40xGE SFP          7600-ES+40G        JAE114632R4  0.300  Ok
  5  Policy Feature Card 3       WS-F6K-PFC3BXL     SAD0851042D  1.4    Ok
  5  MSFC3 Daughterboard         WS-SUP720          SAD085002WF  2.2    Ok
  6  7600 ES+ DFC LITE           7600-ES+3C                      0.301  Ok
  6  7600 ES+ 4x10GE XFP         7600-ES+4TG        JAE1151864W  0.201  Ok

Mod  Online Diag Status
---- -------------------
```

```
  1   Pass
  2   Pass
  3   Pass
 3/2  Pass
  4   Pass
  5   Pass
  6   Pass
Router#
Router2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
PE2(config)#no power enable module 6
PE2(config)#end
PE2#
*May 15 10:30:54.227 UTC: %SYS-5-CONFIG_I: Configured from console by console
PE2#
*May 15 10:30:53.325 UTC: %C6KPWR-SP-4-DISABLED: power to module in slot 6 set off (admin
request)
Router#
```

Preparing for Online Removal of a SFP or XFP Modules

The Cisco 7600 series routers support OIR of a SFP or XFP modules independently of removing the Cisco 7600 Series ES+ line card. This means that a Cisco 7600 Series ES+ line card can remain installed in the router with one XFP remaining active, while you remove another XFP from one of the line card ports. Or, that an Cisco 7600 Series ES+ line card can remain installed in the router with some number of SFP modules remaining active, while you remove other SFP modules from the line card ports.

The interface configuration is retained (recalled) if a Cisco 7600 Series ES+ line card or SFP or XFP is removed and then replaced with one of the same type.

If you are planning to remove a Cisco 7600 Series ES+ line card along with its SFP or XFP modules, then you do not need to follow the instructions in this section. To remove a Cisco 7600 Series ES+ line card, see the "Preparing for Online Removal of a Cisco 7600 Series Ethernet Services Plus Line Card" section on page 4-2.

SFP Module or XFP Module OIR

The SFP and XFP modules support online insertion and removal (OIR). However, if the line card is already installed in the router and the system is operational, we recommend that you administratively shut down the SFP or XFP module port before installing a new module.

CHAPTER 5

Installing and Removing SFP and XFP Modules

This chapter describes how to install or remove small form-factor pluggable (SFP modules or XFP modules) on the Cisco 7600 Series Ethernet Services + line cards. This chapter contains the following sections:

Removing and Installing SFP Modules

Note The Cisco 7600 ES+ will only accept the SFP modules listed as supported in this document. An SFP check is run every time an SFP module is inserted into a Cisco 7600 ES+ and only SFP modules that pass this check are usable.

Before you remove or install an SFP module, read the installation information in this section and the "Laser/LED Safety" section on page 3-8.

Caution Protect the SFP modules by inserting clean dust covers into them after the cables are removed. Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another SFP module. Avoid getting dust and other contaminants into the optical ports of your SFP modules, because the optics will not work correctly when obstructed with dust.

Caution It is strongly recommended that you do not install or remove the SFP module with fiber-optic cables attached to it because of the potential of damaging the cable, the cable connector, or the optical interfaces in the SFP module. Disconnect all cables before removing or installing an SFP module.

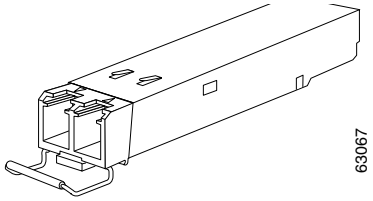
Removing and inserting an SFP module can shorten its useful life, so you should not remove and insert SFP modules any more often than is absolutely necessary.

SFP modules use one of four different latching devices to install and remove the module from a port. The four types of SFP module latching devices are described in the following sections:

Bale Clasp SFP Module

The bale clasp SFP module has a clasp that you use to remove or install the SFP module. (See Figure 5-1.)

Figure 5-1 Bale Clasp SFP Module



Removing a Bale Clasp SFP Module

To remove this type of SFP module, follow these steps:

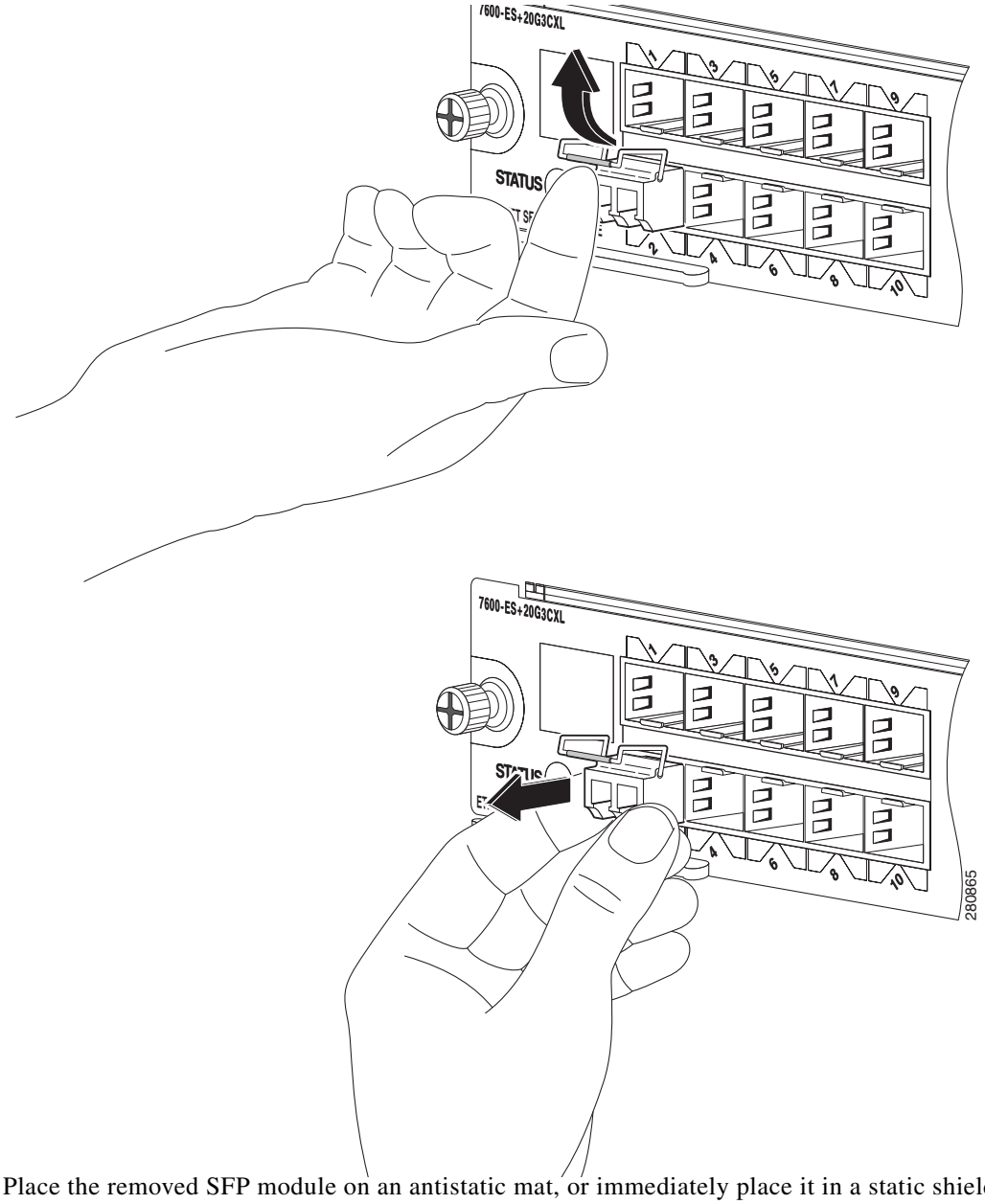
Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

Step 3 Open the bale clasp on the SFP module with your index finger in a downward direction, as shown in Figure 5-2. If the bale clasp is obstructed and you cannot use your index finger to open it, use a small flat-blade screwdriver to open the bale clasp.

Step 4 Grasp the SFP module between your thumb and index finger and carefully remove it from the port, as shown in Figure 5-2.

Figure 5-2 Removing a Bale Clasp SFP Module



Step 5 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 6 Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

Installing a Bale Clasp SFP Module

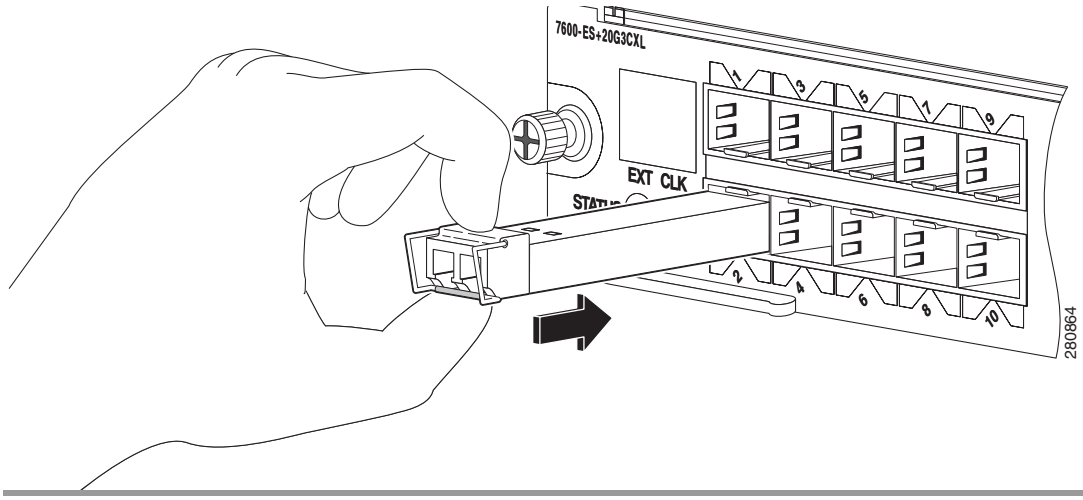
To install this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Close the bale clasp before inserting the SFP module.

Step 3 Line up the SFP module with the port and slide it into the port. (See Figure 5-3.)

Figure 5-3 Installing a Bale Clasp SFP Module into a Port

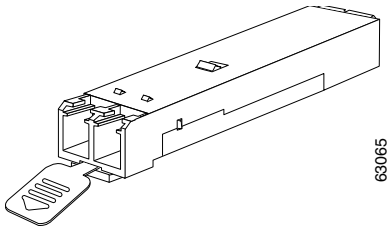


Note Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

Mylar Tab SFP Module

The mylar tab SFP module has a tab that you pull to remove the module from a port. (See Figure 5-4.)

Figure 5-4 Mylar Tab SFP Module



Removing a Mylar Tab SFP Module

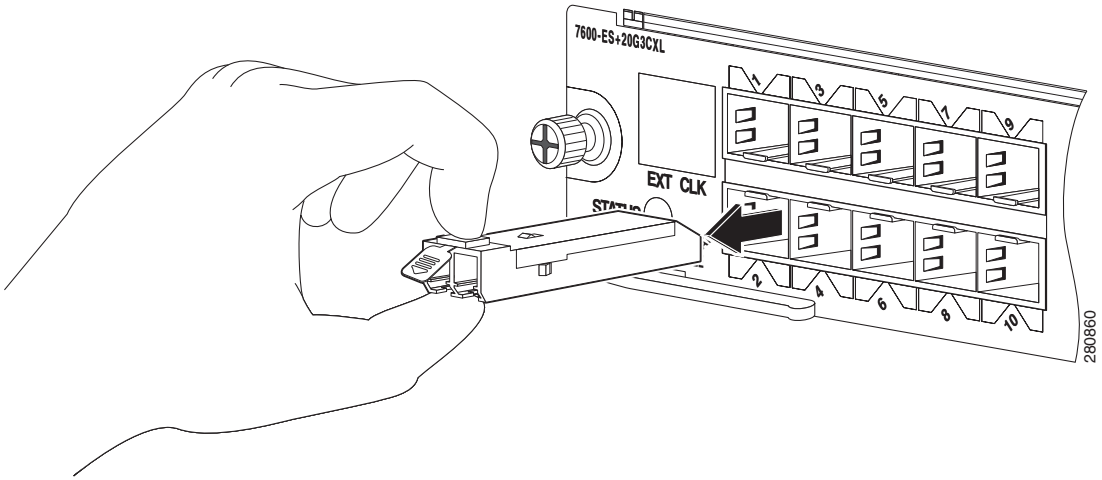
To remove this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

Step 3 Pull the tab gently in a slightly downward direction until it disengages from the port, then pull the SFP module out. (See Figure 5-5.)

Figure 5-5 Removing a Mylar Tab SFP Module



Step 4 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 5 Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

Caution When pulling the tab to remove the SFP module, be sure to pull in a straight outward motion so you remove the SFP module from the port in a parallel direction. Do not twist or pull the tab, because you might disconnect it from the SFP module.

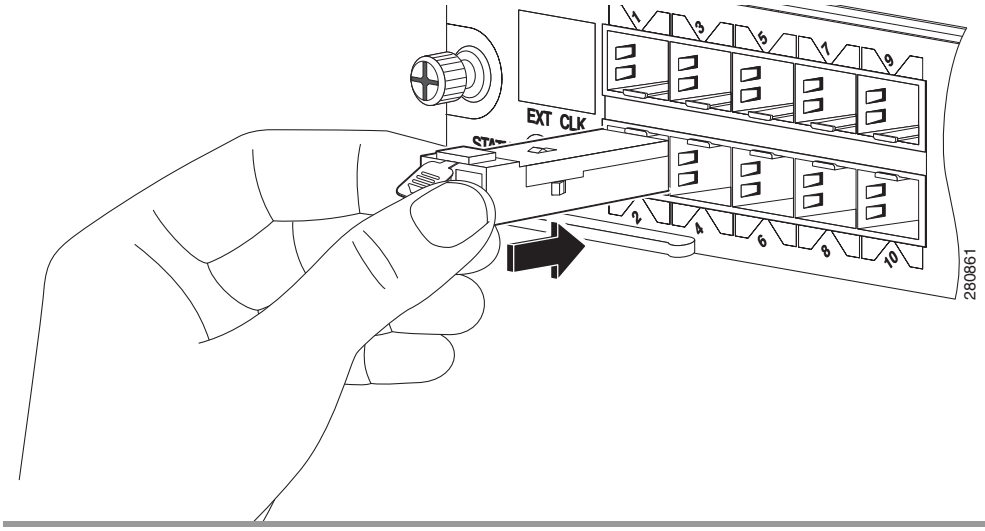
Installing a Mylar Tab SFP Module

To install this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Line up the SFP module with the port, and slide it into place. (See Figure 5-6.)

Figure 5-6 Installing a Mylar Tab SFP Module

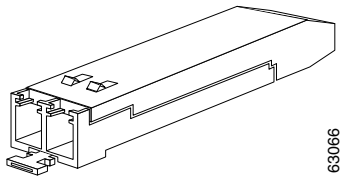


Note Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

Actuator Button SFP Module

The actuator button SFP module includes a button that you push in order to remove the SFP module from a port. (See Figure 5-7.)

Figure 5-7 Actuator Button SFP Module



Removing an Actuator Button SFP Module

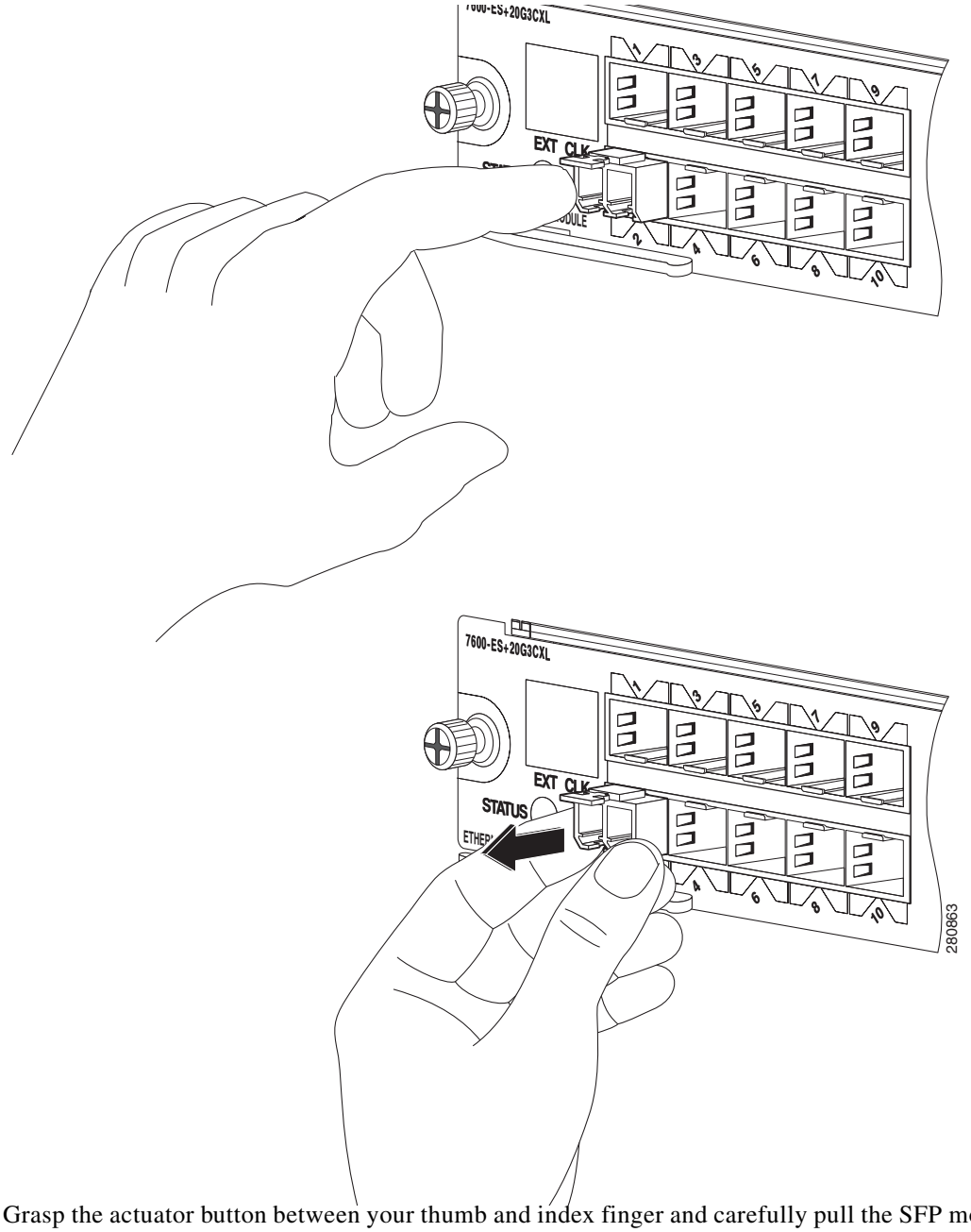
To remove this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

Step 3 Gently press the actuator button on the front of the SFP module until it clicks and the latch mechanism activates, releasing the SFP module from the port. (See Figure 5-8.)

Figure 5-8 Removing an Actuator Button SFP Module from a Port



Step 4 Grasp the actuator button between your thumb and index finger and carefully pull the SFP module from the port.

Step 5 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 6 Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

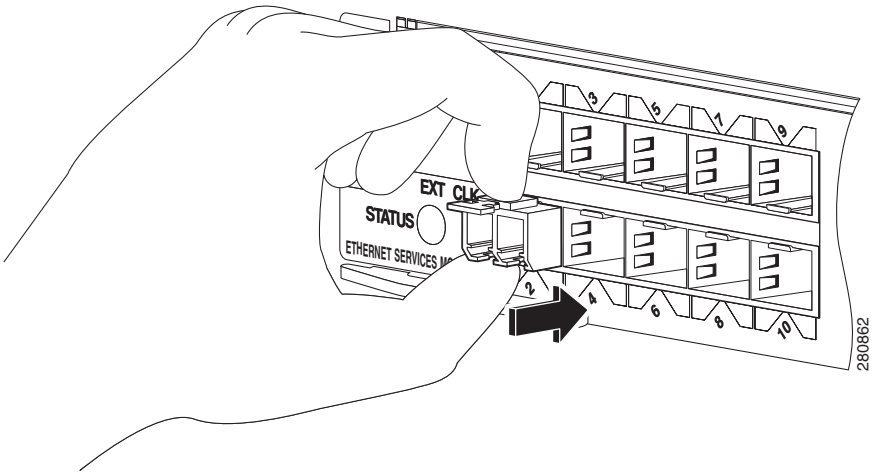
Installing an Actuator Button SFP Module

To install this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Line up the SFP module with the port and slide it in until the actuator button clicks into place. (See Figure 5-9.) Be sure not to press the actuator button as you insert the SFP module because you might inadvertently disengage the SFP module from the port.

Figure 5-9 Installing an Actuator Button SFP Module

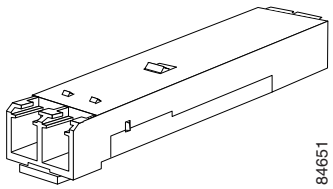


Note Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

Slide Tab SFP Module

The slide tab SFP module has a tab underneath the front of the SFP module that you use to disengage the module from a port. (See Figure 5-10.)

Figure 5-10 Slide Tab SFP Module



Removing a Slide Tab SFP Module

To remove this type of SFP module, follow these steps:

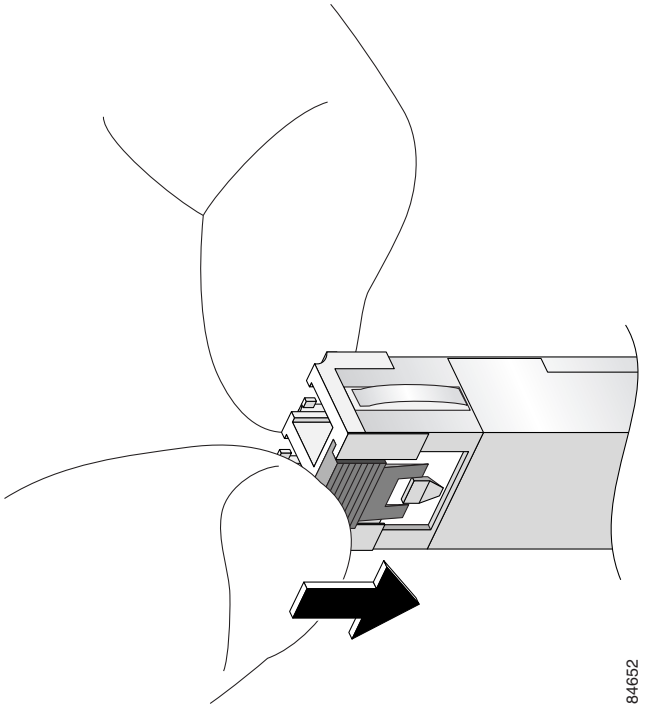
Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

Step 3 Grasp the SFP module between your thumb and index finger.

Step 4 With your thumb, push the slide tab on the bottom front of the SFP module in the direction of the line card to disengage the module from the line card port. (See Figure 5-11.)

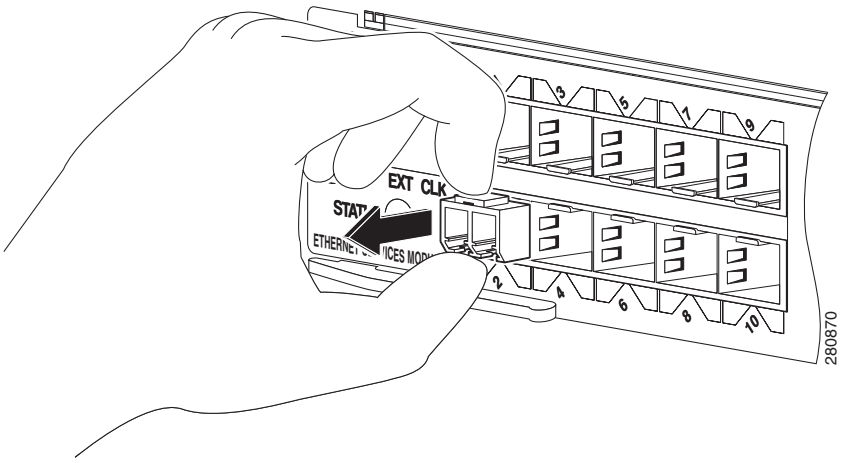
Figure 5-11 Disengaging the Slide Tab



Step 5 With the tab still pushed, carefully pull the SFP module from the port as shown in Figure 5-12.

Caution You must disengage the SFP module by pushing on the slide tab before you can pull out the SFP module. If you pull on the SFP module without disengaging the tab, you can damage the SFP module.

Figure 5-12 Removing a Slide Tab SFP Module



Step 6 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 7 Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

Installing a Slide Tab SFP Module

To install this type of SFP module, follow these steps:

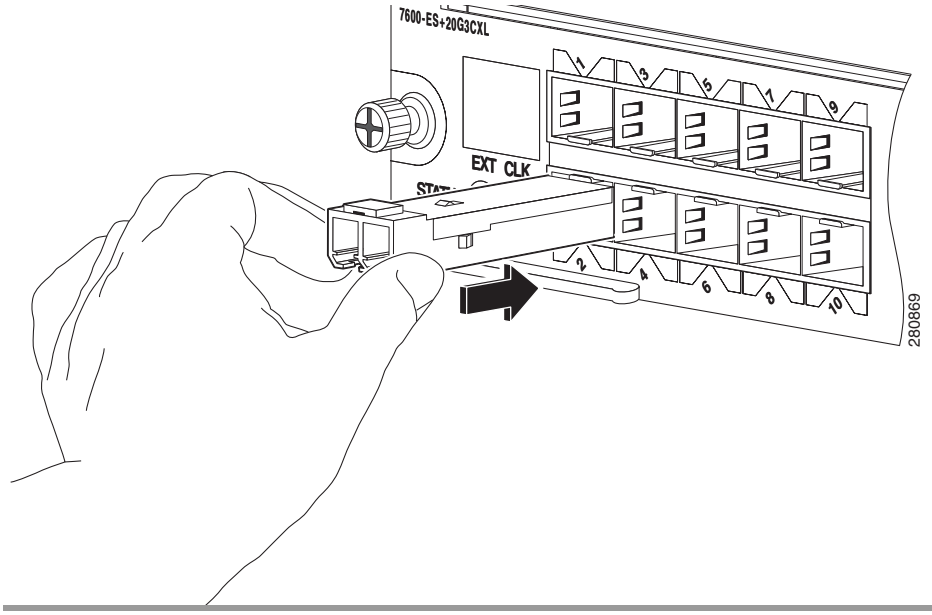
Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Hold the SFP module with the hardware label facing up.

Caution The SFP module must be inserted with the hardware label facing up to avoiding damaging the module or the line card.

Step 3 Insert the SFP module into the appropriate slot and gently push on it until it snaps into the slot tightly. (See Figure 5-13.)

Figure 5-13 Installing a Slide Tab SFP Module



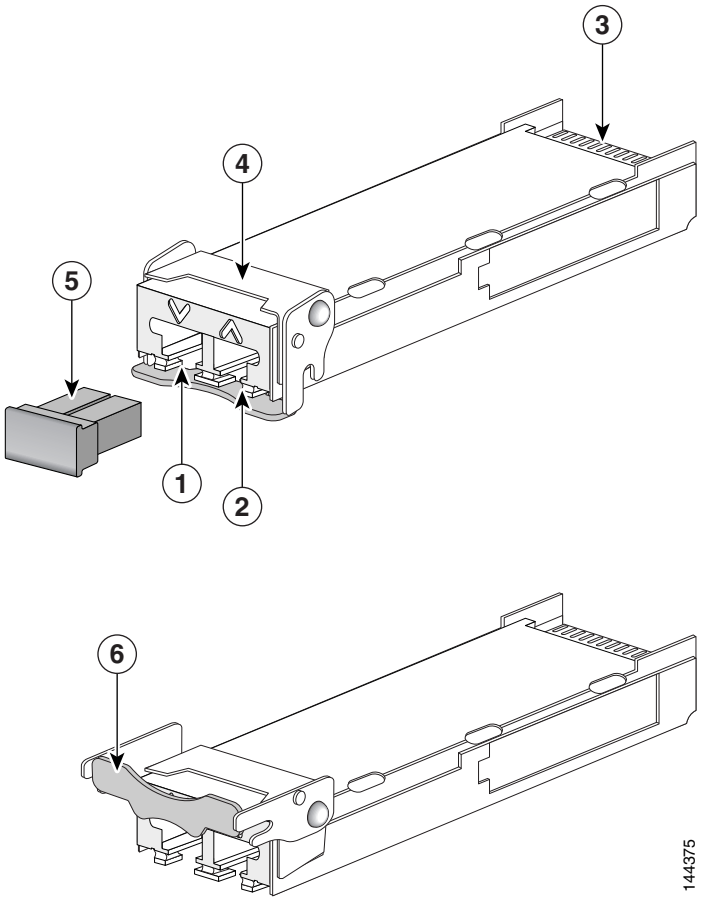
Note Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

Removing and Installing XFP Modules

Note The dual LC connector on the XFP transceiver modules support network interface cables with either Physical Contact (PC) or Ultra-Physical Contact (UPC) polished face types. The dual LC connector on the XFP transceiver modules do not support network interface cables with an Angle Polished Connector (APC) polished face type.

The 10-Gigabit XFP transceiver module is a hot-swappable I/O device that plugs into 10-Gigabit ports. (See Figure 5-14.) The XFP transceiver module connects the electrical circuitry of the system with the optical network.

Figure 5-14 10-Gigabit XFP Transceiver Module



1	Transmit optical bore	**4**	Bale clasp (locked position)
2	Receive optical bore	**5**	Dust plug
3	Transceiver socket connector	**6**	Bale clasp (unlocked position)

Installing the 10-Gigabit XFP Transceiver Module

Caution The XFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling XFP transceivers or coming into contact with system modules.

To install an XFP transceiver, follow these steps:

Step 1 Remove the XFP transceiver from its protective packaging.

Note Do not remove the optical bore dust plugs until directed to do so later in the procedure.

Step 2 Check the label on the XFP transceiver body to verify that you have the correct model for your network.

Step 3 Position the XFP transceiver in front of the XFP socket opening on the module. Slide the XFP transceiver part of the way into the transceiver socket on the system module front panel.

Step 4 Remove the optical bore dust plug from the XFP transceiver.

Step 5 Pivot the bale clasp up so that it is parallel with the transceiver body. (See Figure 5-15.)

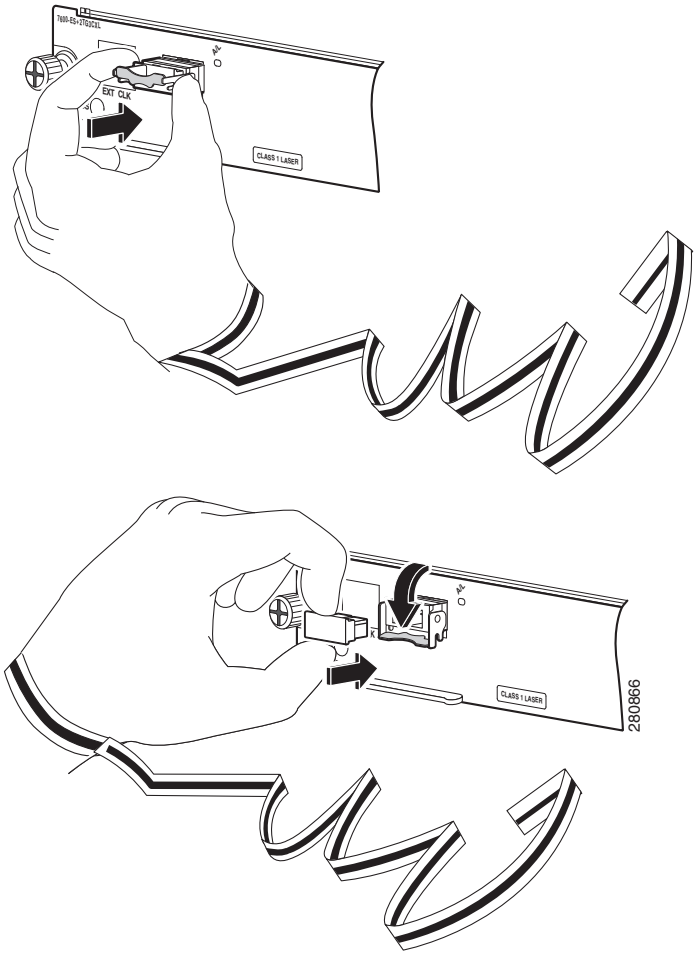
Step 6 Continue sliding the XFP transceiver into the socket until the XFP transceiver is mated with the transceiver socket connector.

Step 7 Latch the XFP transceiver in the transceiver socket by pivoting the bale clasp down so that the bale clasp is perpendicular to the transceiver body. (See Figure 5-15.)

Caution If the latch is not fully engaged, you may accidentally disconnect the XFP transceiver.

Step 8 Immediately reinstall the dust plug in the XFP transceiver optical bores. Do not remove the dust plug until you are ready to attach the network interface cable.

Figure 5-15 Installing the 10-Gigabit XFP Transceiver Module



Note 10-Gigabit XFP transceivers are keyed to prevent incorrect insertion.

Note Before removing the dust plugs and making any optical connections, follow these guidelines:

- Always keep the protective dust plugs on the unplugged fiber-optic cable connectors and the transceiver optical bores until you are ready to make a connection.
- Always inspect and clean the LC connector end faces just before making any connections. Refer to the Tip on this page for a pointer to a fiber-optic inspection and cleaning white paper.
- Always grasp the LC connector housing to plug or unplug a fiber-optic cable.

a. Remove the dust plugs from the optical network interface cable LC connectors. Save the dust plugs for future use.

b. Inspect and clean the LC connector's fiber-optic end faces.

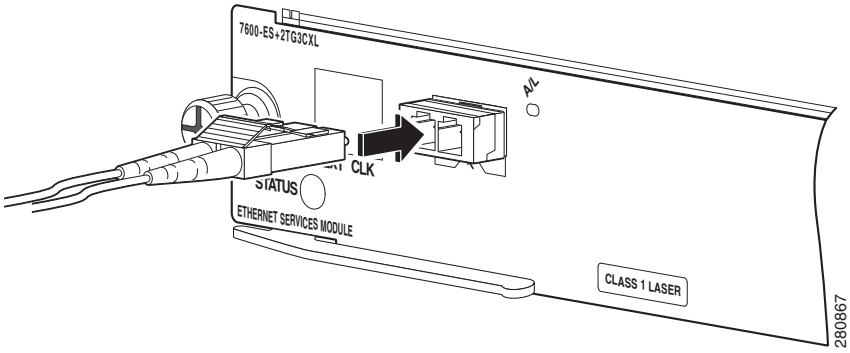
Tip For complete information on inspecting and cleaning fiber-optic connections, refer to this URL:

http://www.cisco.com/en/US/tech/tk482/tk607/technologies_white_paper09186a0080254eba.shtml

c. Remove the dust plugs from the XFP transceiver module optical bores.

d. Immediately attach the network interface cable LC connectors to the XFP transceiver module. (See Figure 5-16 for cabling the XFP transceiver module.)

Figure 5-16 Cabling a10-Gigabit XFP Transceiver Module



Removing the 10-Gigabit XFP Transceiver Module

Caution The XFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling XFP transceivers or coming into contact with modules.

If you are removing an XFP transceiver, follow these steps:

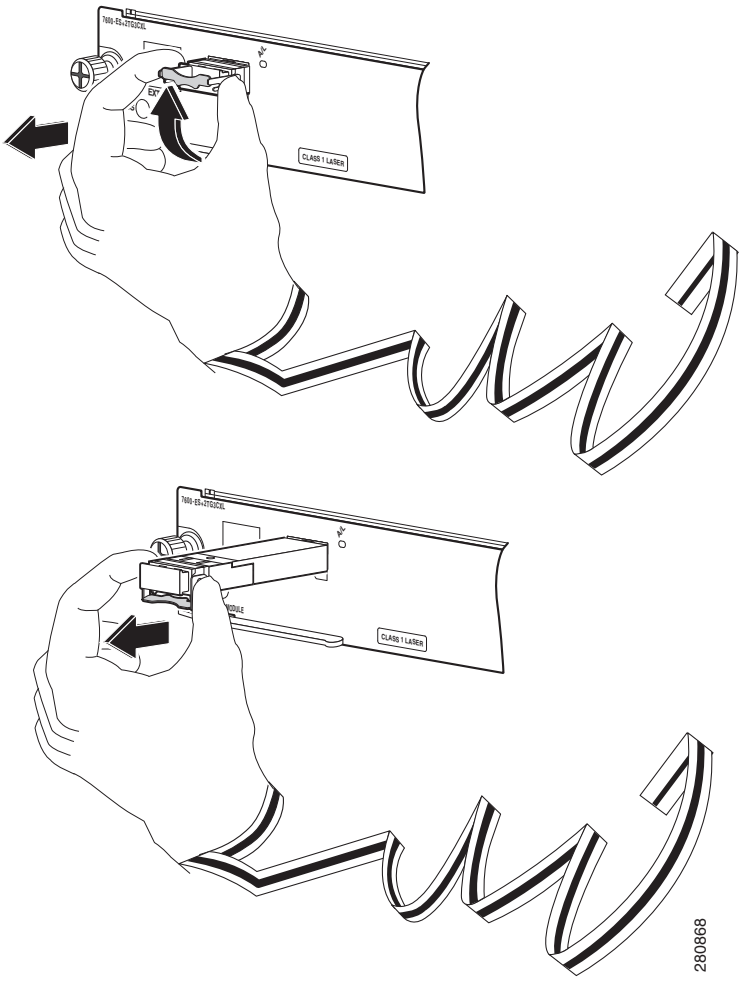
Step 1 Disconnect the network interface cable from the XFP transceiver connectors. Immediately reinstall the dust plug in the fiber-optic cable LC connector.

Step 2 Pivot the XFP transceiver bale clasp up to release the XFP transceiver from the socket. (See Figure 5-17.)

Step 3 Slide the XFP transceiver out of the socket. Pivot the bale clasp down and immediately install the dust plug in the XFP transceiver optical bores. (See Figure 5-17.)

Step 4 Immediately place the XFP transceiver in an antistatic bag.

Figure 5-17 Removing the 10-Gigabit XFP Transceiver



CHAPTER 6

Troubleshooting

This chapter describes how to troubleshoot the installation of the Cisco 7600 Series Ethernet Services + line cards on the Cisco 7600 series routers. This chapter contains the following sections:

Troubleshooting Installation Issues

This section describes troubleshooting the installation of the Cisco 7600 Series ES+ line card. Possible problems, observations and comments, and solutions are indicated for the following troubleshooting symptoms:

- Cisco 7600 Series ES+ line card transitions repeatedly from on to off
- Cisco 7600 Series ES+ line card is deactivated

Cisco 7600 ES+ Line Card Transitions Repeatedly From On to Off		
Possible Problem	**Observations and Comments**	**Solutions**
Cisco 7600 Series ES+ line card is booting up; this is normal operation	Cisco 7600 Series ES+ line card STATUS LED alternates green, amber, or off	Wait 30 seconds until the boot process completes and the STATUS LED stays on.

Cisco 7600 ES+ Line Card Transitions Repeatedly From On to Off		
Possible Problem	**Observations and Comments**	**Solutions**
Cisco 7600 Series ES+ line card does not go beyond the bootup stage	Cisco 7600 Series ES+ line card STATUS LED transitions continue and alternates green, amber, or off	Follow the recommended action for the displayed error message.
Cisco 7600 Series ES+ line card is not up to date	During Cisco 7600 Series ES+ line card initalization, the need to update the FPGA is automatically detected	Follow the system prompts to update the FPGA image. If the Cisco 7600 Series ES+ line card is cycling because of an FPD problem, the most likely cause is a FPD failure or that the FPD package file is not present. For more information about performing FPD upgrades, refer to the “Upgrading Field-Programmable Devices” chapter in the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide .

Cisco 7600 ES+ Line Card Is Deactivated		
Possible Problem	**Observations and Comments**	**Solutions**
Cisco 7600 Series ES+ line card is not fully seated in the chassis slot	Output of the **show diag** *slot* command STATUS LED is off	Follow this procedure: • Remove the Cisco 7600 Series ES+ line card from the slot. • Inspect the Cisco 7600 Series ES+ line card. Verify there are no bent pins or parts and that there is nothing that could prevent a good connection. • Insert the Cisco 7600 Series ES+ line card into the chassis slot.
Cisco 7600 Series ES+ line card is not at the minimum hardware revision level	Error message indicating the Cisco 7600 Series ES+ line card is not at the minimum FPGA revision level Output of the **show hw-module subslot fpd** command Output of the **show diag slot** command STATUS LED is off	Follow the FPD upgrade process to update the FPGA. For more information about performing FPD upgrades, refer to the “Upgrading Field-Programmable Devices” chapter in the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide .

Troubleshooting Line Card Power Issues

Table 6-1 provides solutions for troubleshooting line card issues.

Table 6-1 Troubleshooting Line Card Power Issues

Problem	Solution
If a line card fails to operate or power up	1. Ensure that the card is seated firmly in the slot. 2. Ensure that you have placed the gold edge of the PCB in the guide rails of the chassis. This prevents damage to the connector placed at the rear side the board. 3. Check whether the ejector levers are latched and that the captive screws are fastened properly. If you're uncertain, unlatch the levers, loosen the screws, and attempt to reset the supervisor again. 4. Examine the power supply to see whether the complete chassis is receiving power. 5. Use the show power command to confirm if the chassis has sufficient power to initiate the new inserted line card. 6. Use the status LED on the line card to verify the correct installation of the card. If the card is installed correctly, the Status LED turns green. 7. Ensure that you have installed the line cards in their designated slots. **Note** All line cards can be inserted in all the slots of chassis; however 7613 chassis has exceptions. Dual fabric channel line cards such as (ES20 and ES+ cards) can be inserted only in 9 to13 slots of 7613 chassis.

Miscellaneous Line Card Issues

Table 6-2 provides solutions for troubleshooting line card issues.

Table 6-2 Troubleshooting Miscellaneous Line Card Issues

Problem	Solution

Insufficient power	• When multiple line cards are inserted in the 7600 chassis, some cards may not be able to power up due to insufficient power. If the power required by the line card exceeds the power available in the system, the line card is denied power and is shut down. In such a case, use the **show power** command to verify how much power is used and available.
	• Execute the command in the configuration mode to deny power to a line card.
	`Router# configure terminal`
	`Router(config)# no power enable module <slot_number>`
	On doing this, the power consumed by the line card before turning it OFF, is returned to the total power available in the system. This is handy in bringing up another line card. If you have manually disabled power to a line card, you can enable it with the following config mode command:
	`Router(config)# power enable module <slot_number>`

Line card image not bundled in the IOS image	• For a line card to bootup, the line card image has to be bundled in the IOS image. Not all line cards are supported with every image. A line card does not bootup if its image is not bundled with the system image. Execute the **show power** and **dir sup-microcode** commands to determine if the line card image is bundled with the IOS image.
Find Master Timer expiry	• This problem occurs when the RP does not process the Find Master Messages in time, or line card crashes or is unable to download the image from the supervisor. • If one of the CPUs is not able to load the image from the SP, try with a different image and if the issue persists, replace the flexwan. If any of the CPUs has crashed, collect the crash information data to analyze further.
Faulty hardware **Note** Bad hardware can also be a reason for the line card not booting up. There are no specific pointers which indicate that the line card hardware is bad. But if none of the above reasons match the failure of the line card, it could a bad hardware issue.	• This following message indicates that the module software cannot read the module hardware version. This condition indicates a hardware error. `00:02:51: %CWPA-2-BAD_HWVERS: Unable to determine board hardware version`

Problem	Solution
SCP Keepalive Failure	• The SP and the MSFC periodically poll each individual LC in the chassis for its health via SCP keepalives. Each LC in turn, must respond within a certain amount of time (dictated by the SCP keepalive timer) to indicate its health. If the LC fails to respond to the keepalives within the stipulated period of time, the MSFC assumes that there is an issue with the LC and power cycles it. When the LC comes back online, the SCP keepalives are resumed. • A line card might be unable to respond to the scp keepalives under situations of extreme stress when the CPU is busy with higher priority tasks, such as packet switching, interrupt processing etc. • Execute the **show scp status** and **show scp line cards** command to gather detailed information about the SCP process and health of each LC. A **show diagbus** indicates any errors with the LC. • Execute the **test scp line card keepalive disable** exec command on the RP console to disable the SCP keepalive timer and debug LC issues. To prevent the LC from being power cycled and losing its information, ensure that you disable the SCP keepalives for some time.
Line Card in ROM monitor	• Linecards have a ROMMON variable **DL_DISABLE** depending on which line card auto boots or remains in ROMMON waiting for manual boot. If **DL_DISABLE** is set to 0, line card does not boot automatically but waits for the user to manually boot with respective line card image (from line card console). Line card auto boots only if **DL_DISABLE**=1. When **DL_DISABLE**=0 and line card doe not initialize, SCP Keepalive Failure messages appear on RP console.

Problem	Solution
SCP Download Failures	• A line card is reset by the SP with messages that SCP download failed or module reloaded during reset. This occurs at the time of bootup with a heavy configuration and a many line cards. Execute the **debug cwan oir** command to check the RP status. When a line card sends a Find Master to the RP, some of the messages are sent to SP to confirm if the module is online. If the message fails to reach the SP, then SP resets the module with message that SCP download has failed. If the line card, does not receive the response in the time, the line card resets itself. • Reload the line card and connect the LC console and check the status. If there is a problem with ROMMON download of the image from the SP, then the ROMMON of the line card should then be upgraded to the latest version. If a bay crashes, collect the stack trace to identify problem.

Error Message `%CPU_MONITOR-SP-6-NOT_HEARD : CPU_MONITOR messages have not been heard for 61 seconds [2/0]`
 	
`%CPU_MONITOR-SP-6-NOT_HEARD: CPU_MONITOR messages have not been heard for 151 seconds [2/0]`
	An SCP ping is sent every two seconds to all the line cards. If no response is received after three pings (that is after 6 seconds), it is counted as the first failure. After 25 such successive failures, that is after 150 seconds of not receiving a response from the line card, the SUP power cycles that line card. After every 30 seconds, the following error message is seen on the router:
	
	`%CPU_MONITOR-SP-6-NOT_HEARD: CPU_MONITOR messages have not been heard for 61 seconds [2/0]`
	
	`%CPU_MONITOR-SP-6-NOT_HEARD: CPU_MONITOR messages have not been heard for 151 seconds [2/0]`
	
	After 150 seconds, the module gets power cycled with these syslogs:
	
	`%CPU_MONITOR-SP-3-TIMED_OUT: CPU_MONITOR messages havefailed, resetting module [2/0]`
	
	`%OIR-SP-3-PWRCYCLE: Card in module 1, is being power cycled off (Module not responding to Keep Alive polling)`
	
	`%OIR-SP-3-PWRCYCLE: Card in module 2, is beingpower-cycled off (Heartbeat Messages Not Received From Module)`

Troubleshooting ES Plus Line Card States

Table 6-3 provides solutions for troubleshooting line card issues.

Table 6-3 Troubleshooting Line Card States

Problem	Solution
Troubleshooting Line Card States	• LED on the line card front panel is green indicating that the that line card is up and running with IOS. • The **show module** command shows the status of line card slot as **Ok** and the status of the Distributed Forwarding submodule as **Ok** indicating that supervisor recognizes the line card and if the line card is powered up and online in the C7600 system or not. • LED on the SPA front panel is green. • The **show hw-module subslot x/y oir** [*internal*] command indicates that the SPA operation status is **Ok**.. • The **show running-config** command shows interfaces for the line card and if the controllers for the installed SPAs (if any) are installed. • The **show ip interface brief** command shows the configured interfaces for the line card if they are ready for configuration.

Using debug Commands

The **debug hw-module subslot** command is intended for use by Cisco Systems technical support personnel. For more information about the **debug hw-module subslot** command, see the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide .

Caution Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

For information about other **debug** commands supported on the Cisco 7600 Series ES+ line card and to view the explanations and recommended actions for the Cisco 7600 series router error messages, including messages related to the Cisco 7600 Series ES+ line card, refer to the following documents:

- *Cisco IOS Release 12.2 SR Command References*
- *Cisco 7600 Series Cisco IOS System Message Guide, 12.2SR*

Packing a Cisco 7600 ES+ Line Card for Shipment

This section provides step-by-step instructions for packing a Cisco 7600 Series ES+ line card for shipment. Before beginning this procedure, you should have the following original Cisco Systems packaging materials:

- Static shielding bag
- Smaller inner carton
- Larger exterior carton
- Two foam packing cushions

Caution The Cisco Systems original packaging is to be used for the shipment of all Cisco 7600 Series ES+ line cards. Failure to properly use Cisco Systems packaging can result in damage or loss of product.

Warning **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.**

Note These instructions assume that the Cisco 7600 Series ES+ line card has been removed from the router according to the recommended procedures specified in this guide.

To pack a Cisco 7600 Series ES+ line card for shipment, perform the following steps:

Step 1 Insert the Cisco 7600 Series ES+ line card into the static shielding bag.

Step 2 Insert the bagged Cisco 7600 Series ES+ line card into the smaller inner carton. Be careful to position the Cisco 7600 Series ES+ line card so that the bottom motherboard lip is held by the packaging cutout.

Step 3 Close the smaller inner carton and tape the sides closed.

Step 4 Place the sealed smaller inner carton containing the Cisco 7600 Series ES+ line card into the two foam packing cushions (they only fit one way).

Step 5 Place the sealed smaller inner carton and packing cushions into the larger exterior carton, and seal the larger exterior carton with tape for shipment.